THE Chemical Age

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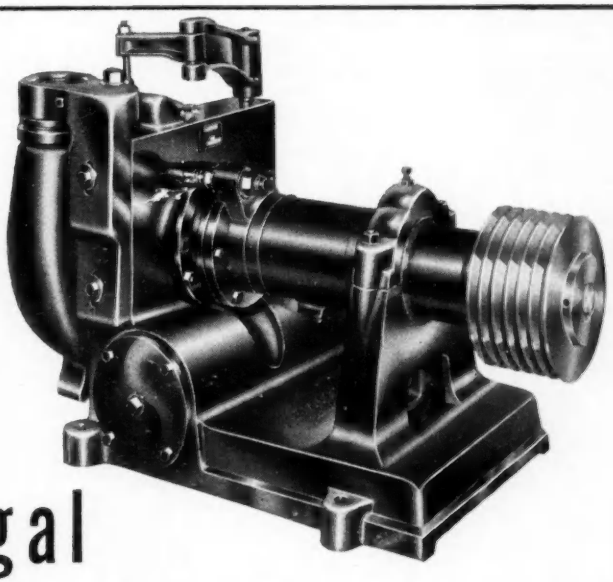

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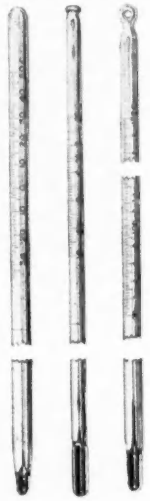

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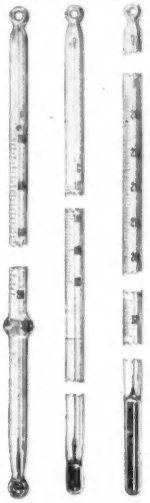

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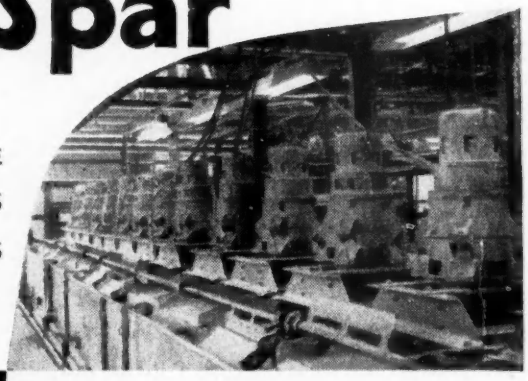

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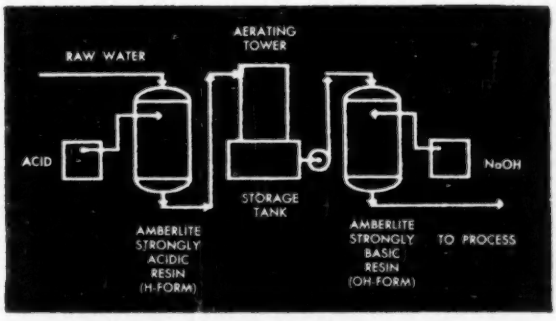

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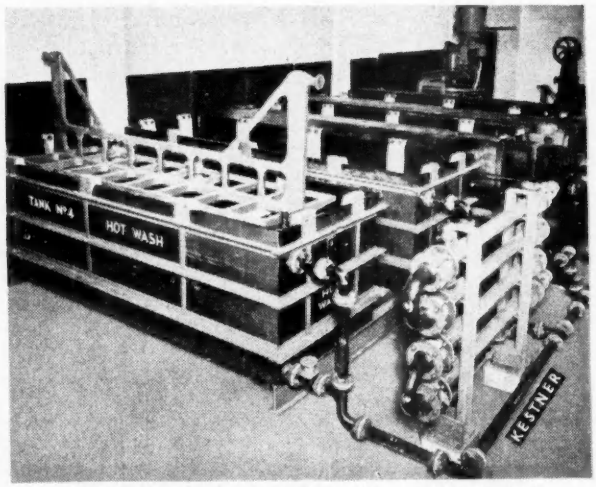

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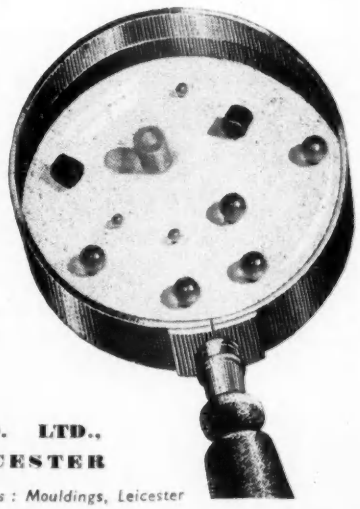

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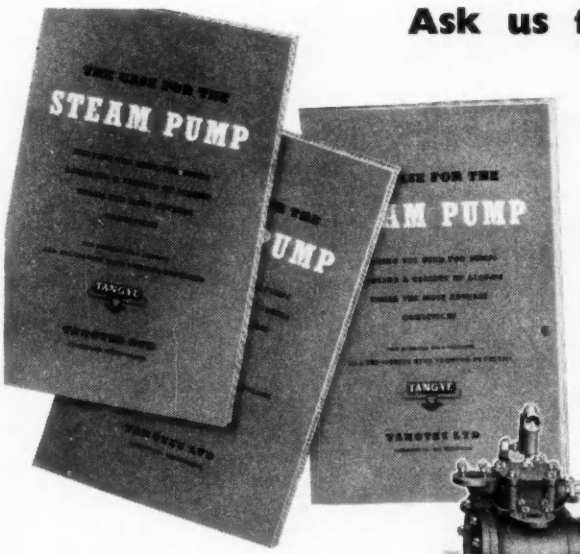

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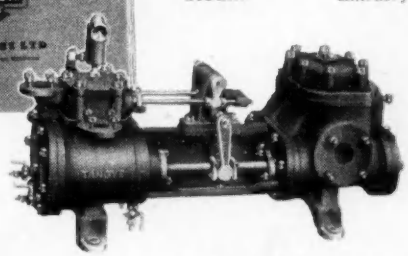

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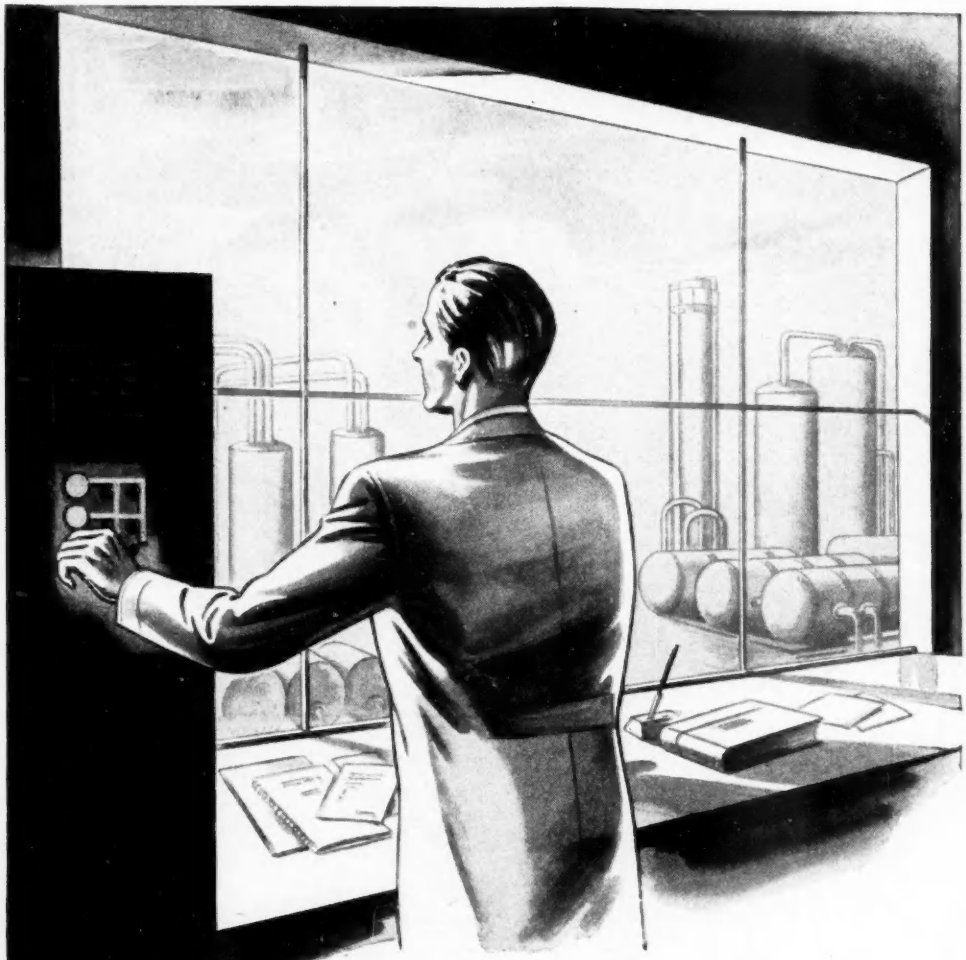

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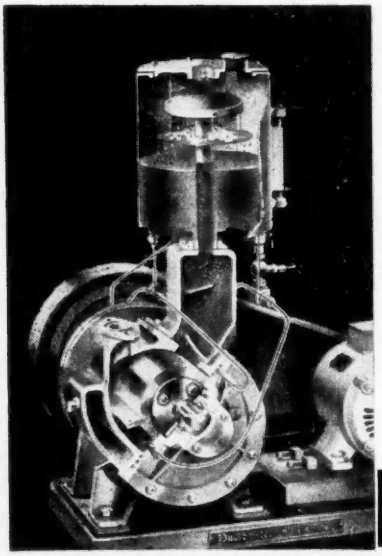

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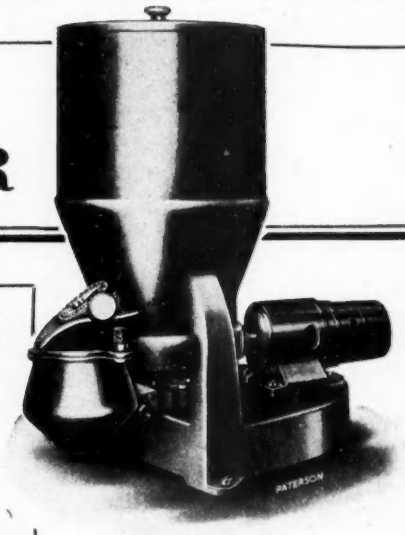

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The Civilian Atom

MORE publicity for the atom hardly seems necessary at first thought. No subject has preoccupied the world's headlines more frequently and alarmingly since 1945. Neither the steam age nor the electric age arrived with a tenth as much heralding; perhaps the only comparable technological event was the advent of the aeroplane, but even the aeroplane was only slightly tinged by fear in its first years despite Northcliffe's prophetic *Daily Mail* headline announcing Blériot's flight, 'Britain no Longer an Island'. Fear has accompanied atomic fission from the time it became possible, and it is no exaggeration to say that it is fear with an intensity that acts as its own anæsthetic, for the destructive potentialities of atomic weapons are so huge that most people refuse to contemplate them. The mind that dwells too often and too deeply upon hydrogen bombs can know no comfort even in a period of peace.

Science and scientists are casualties of the first atomic decade. In the eyes of laymen it is the scientists who have made atomic weapons possible. If atomic warfare ever occurs, there is a strong possibility that residual society would be dominated by an anti-scientific impulse as violent as some of history's worst anti-racial demonstrations. That such a reaction would be unjust and illogical will count little in the face of recent disaster and its recurring harvests of misery.

What is badly needed for this second decade of the atomic age is a re-orientation of publicity for the fissionable atom. There are signs that this is being realised. The time, too, is propitious, for there seems to be something of a pause in the world's conflict of power politics. It may be no more than a temporary pause, an illusory halt in low temperature warfare; yet not to grasp its opportunity would be criminal folly. History alone will tell whether 1955 can be a date of turning-point.

Most scientists are well aware that atomic fission has far greater potentialities for the betterment of man than for destruction. The budget of hope and fear can show an impressive credit. It would be wrong to assume that this view is shared by more than a minority of laymen. It has proved far easier to develop the force of fission in the form of bombs than to harness it as organised energy to drive machines; this alone has distorted the picture in men's minds. The Press photographs of mushroom plumes of smoke from test explosions are photographs of actuality. The photographs of atomic power plants are still photographs of models. Other great scientific developments have had happier sequences in their seedling periods; generally the public has had at least a taste of peaceful use before adaptation for military purposes has become noticeable. It is against this background that the necessity for a powerful expansion in publicity for the constructive uses of atomic fission must be placed. A new booklet published by the United States Information Service in co-operation with the UK Atomic Energy Authority—'The Promise of the Atom'—paves this urgent way superbly well; so, too, does the travelling exhibition, 'Atoms for Peace', which is also jointly presented by the same bodies.

The exhibition is touring Britain during the next five months, visiting 13 major cities. It can be regarded as a presentation of the proposal by President Eisenhower in December, 1953, in his address to the UN General Assembly, for the creation of an international atomic energy agency. Five 21-ton trailers, each an expandable exhibition unit, show in simple terms and by every kind of visual aid what has already been done to develop the peaceful uses of unlocked atoms' energy. But the booklet—a modest word to describe a 32-large-paged publication—may well have the greater influence upon general opinion. The man in the street who is fearful of atomic bombs or, more commonly, who has dismissed the subject because it is too gruesome to contemplate, is more likely to be persuaded to think about atomic energy and radio-isotopes by reading in the quietness of his home than by the more dramatic and fleeting effects of short films, display panels, and models. The exhibition cannot be seen by everybody, but it is to be hoped that the publication will have a particularly wide circulation and reach areas outside the 13 cities to be visited by the trailer-vans.

The facts of atomic power are stated vividly. One pound of uranium can yield as much energy as 2,600,000 pounds of coal. A piece of uranium the size of a small sugar-cube could drive a train completely round the world or supply a town of 100,000 people with light and heat for nearly three weeks. But such is the rising world population's demand for energy that in US half the coal *ever* consumed has been burned since 1920 and half the oil *ever* consumed has been burned since 1940. At the present rate of growth in power consumption, Britain must produce an extra 60,000,000 tons of coal per year for electricity alone within the next 20 years. Atomic energy is not a new and competitive source of power—it is a vital and additional development if the world is not to outgrow its resources. Moreover, it is already estimated that the known sources of uranium can provide sufficient world power for the next 6,000 years. This is indeed the reverse side of this fearful modern coin. Every man and woman of sense must face the challenge. Is atomic energy in the form of bombs to be used to settle the conflicts of national populations, conflicts with ideological shape and sound, but at least partially caused by the demands of more and more people upon limited resources? Or is it to be used to remove that basic cause of international distrust and friction? There is some reason to believe that Russia is far from backward in developing peaceful uses of atomic energy; if this is so, it seems difficult to believe that she will not eventually want to play one of the leading parts in the projected international agency.

Both the booklet and the exhibition also emphasise the benefits of radio-isotopes. These are developments that scientists take for granted already, but it is wrong to suppose that the general public is yet well-informed about them. The biological sciences, and especially medicine, have been given their most powerful research weapon since the microscope. Radio-isotopes provide a magnificant example of international co-operation in atomic matters. Despite the curtain of classification and secrecy that has had to fall upon military developments, 6,000 out of 17,000 radio-isotope units produced in 1954 here at Harwell and Amersham were exported to 41 different countries. How many people in this country, let alone outside it, know that Britain leads in this aspect of atomic development? We lead, too, in the development of atomic power stations with Calder Hall nearing completion and work already started on another site in Scotland. It is a leadership that Russia could possibly challenge, but her claims to have operated power stations already have not been substantiated with details. However, national competition is relatively unimportant when set beside the prospect of international co-operation. Atomic fission must be liberated from its deadly setting of fear and secrecy. Progress along this path might well bring the time when the material for peaceful atomic energy at present stored in bombs can be extracted for use in power stations. Swords into ploughshares has its atomic age version and the transformation could add enormously to the world's wealth.

Notes & Comments

Low Pressure Polyethylene

THE two new low pressure processes for producing polyethylene (see, e.g., THE CHEMICAL AGE, 1955, 72, 1087), continue to attract great interest in foreign chemical circles. In the US it is reported that almost $500,000 has been spent on securing licences for the German (Ziegler) process and several large-scale plants are being built there and in Germany. Almost as much interest is being shown in the American process and the company responsible for its development, Phillips Petroleum Co., recently announced that they were building a low pressure plant capable of producing the equivalent of one-sixth of the standard polyethylene at the moment being produced in the US. It is doubtful if any chemical engineering process has ever attracted greater world-wide interest.

Wait & Watch

IT is too early yet to pass judgment on either process as the claims being made are very conflicting. Imperial Chemical Industries Limited—who not only discovered polyethylene, but who have one of the largest and most efficient research organisations in the world—have been working on low pressure processes for a long time. They have taken out a number of patents and have produced several types of low pressure polyethylenes. Although they admit their interest in both the Ziegler and Phillips processes, they are not unduly alarmed at the excitement they are causing. Equally interesting, the holders of the exclusive British rights to the Ziegler patents, Petrochemicals Limited (now owned by Shell), do not seem to be in any great hurry to build a plant. British firms, at least, seem convinced that much more research is called for before large-scale production is embarked upon.

No Immediate Threat

VISITORS to Frankfurt last month were interested to see the samples of low pressure polyethylene which were displayed at ACHEMA XI by Farbwerke Hoechst. They were, however, disappointed at the limited range and by the small amount of information that was available concerning physical properties, etc. The claims being made regarding the properties of the materials were far less sensational than had come from the US earlier. Some people gained the impression that the wild enthusiasm which had existed in the early days of low pressure polyethylene was waning and that the new process was perhaps less exciting than had been originally believed. The low pressure product may have higher softening and bursting points, but it will have certain disadvantages as well. It has, for instance, poorer electrical properties and it may not be able to compete in price with conventional polyethylene, as it is said that the low pressure process requires a larger plant. It is possible that the low pressure polymers will have limited specialised uses; it would appear that their chief application will be for certain types of tubing. At the moment, the British high pressure process is not likely to be significantly threatened.

Benzene by Radiation

BOMBARDING acetylene with beta radiation leads to the synthesis of benzene. This is a General Electric Company research development recently announced to the American Chemical Society Division of Physical and Inorganic Chemistry. The cost of the process and the low yield factor are at present disabilities to commercial exploitation. GEC used beta particles from tritium; about 21 per cent of the acetylene was converted into benzene. The temperature of operation was 26° C. Working pressure was varied over a wide range during a number of runs, but the conversion yield appeared to be independent of pressure. It has been known for about 30 years that cuprene —$(C_7H_6)_x$—is formed when acetylene is irradiated with alpha particles, and some cuprene is also formed in the new beta-ray process. It had been expected that

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IT is too early yet to pass judgment on either process as the claims being made are very conflicting. Imperial Chemical Industries Limited—who not only discovered polyethylene, but who have one of the largest and most efficient research organisations in the world—have been working on low pressure processes for a long time. They have taken out a number of patents and have produced several types of low pressure polyethylenes. Although they admit their interest in both the Ziegler and Phillips processes, they are not unduly alarmed at the excitement they are causing. Equally interesting, the holders of the exclusive British rights to the Ziegler patents, Petrochemicals Limited (now owned by Shell), do not seem to be in any great hurry to build a plant. British firms, at least, seem convinced that much more research is called for before large-scale production is embarked upon.

No Immediate Threat

VISITORS to Frankfurt last month were interested to see the samples of low pressure polyethylene which were displayed at ACHEMA XI by Farbwerke Hoechst. They were, however, disappointed at the limited range and by the small amount of information that was available concerning physical properties, etc. The claims being made regarding the properties of the materials were far less sensational than had come from the US earlier. Some people gained the impression that the wild enthusiasm which had existed in the early days of low pressure polyethylene was waning and that the new process was perhaps less exciting than had been originally believed. The low pressure product may have higher softening and bursting points, but it will have certain disadvantages as well. It has, for instance, poorer electrical properties and it may not be able to compete in price with conventional polyethylene, as it is said that the low pressure process requires a larger plant. It is possible that the low pressure polymers will have limited specialised uses; it would appear that their chief application will be for certain types of tubing. At the moment, the British high pressure process is not likely to be significantly threatened.

Benzene by Radiation

BOMBARDING acetylene with beta radiation leads to the synthesis of benzene. This is a General Electric Company research development recently announced to the American Chemical Society Division of Physical and Inorganic Chemistry. The cost of the process and the low yield factor are at present disabilities to commercial exploitation. GEC used beta particles from tritium; about 21 per cent of the acetylene was converted into benzene. The temperature of operation was 26° C. Working pressure was varied over a wide range during a number of runs, but the conversion yield appeared to be independent of pressure. It has been known for about 30 years that cuprene —$(C_2H_2)_x$—is formed when acetylene is irradiated with alpha particles, and some cuprene is also formed in the new beta-ray process. It had been expected that

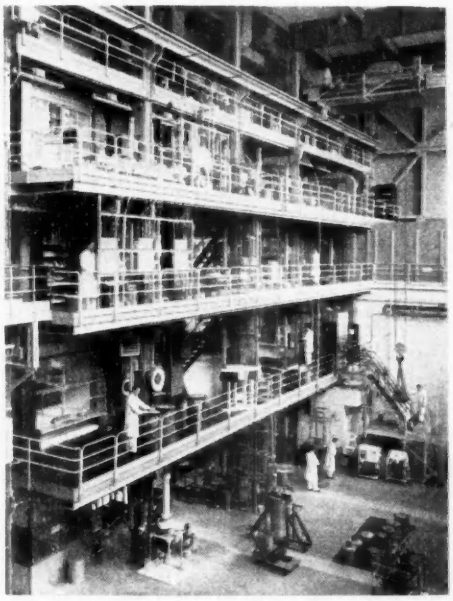
the proportions of cuprene and benzene formed would be determined by working conditions during irradiation, but this was not the case. The two syntheses seem to occur independently. Cuprene is probably formed by straightforward polymerisation of dissociated acetylene, and benzene by cyclisation of acetylene trimmer. Although work of this kind seems likely to remain theoretical at present, it is an indication of the potentialities of irradiation as a method of organic synthesis. It also foreshadows an even more complex future for organic chemists! A generation or so ago organic chemistry was an attractive haven for the student allergic to physics and mathematics. Electronic configuration theories began to disturb this peaceful isolation in the 'thirties, but the organic chemist could still get along without understanding very deeply what dipoles meant. There will be smaller escape still if irradiation becomes a widely used method of synthesising bigger organic molecules.

New Cars Raise Bromine Sales

SALES of bromine and bromine compounds by primary producers in the US in 1953 reached a record total of some 193,000,000 lb.

The increase was credited to the need of modern cars whose higher compression ratios requires the use of more anti-knock fluid in petrol. Ethylene dibromide is an ingredient of anti-knock fluid. There is also a growing interest in bromine compounds as soil, seed and food fumigants.

In 1953 1,000,000 lb. more of elemental bromine were sold in the US than in the previous year. In 1952 income from bromine sales was $30,639,202; in 1953, $35,372,386.



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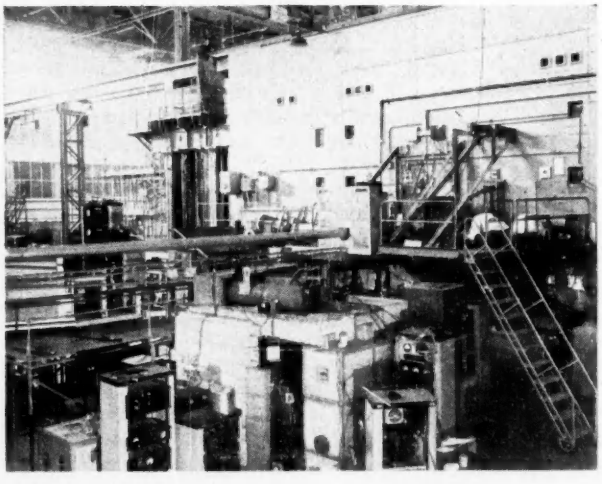

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Two recently released photographs of the British Atomic Energy Research Establishment at Harwell. Above is shown the inside of the chemical engineering building and left is the flight tube of the fast-chopper neutron spectrometer and the 'experimental' face of the Bepo reactor

Analysis of Textiles

General Survey of Methods—Part I

THE first ordinary meeting of the newly formed Midlands Section of the Society for Analytical Chemistry took place in March at Regent House, St. Philip's Place, Birmingham. A lecture on 'The Analytical Chemistry of Textiles' was given by A. G. Hamlin, B.Sc., F.R.I.C., of the British Cotton Industry Research Association.

In 1817, said Mr. Hamlin, Charles Tennant published in the *Annals of Philosophy* a method for determining the alkali content of plant ashes—then the only source of alkali for the textile industry—which represented perhaps the first application of volumetric analysis in industry. At about the same time Charles Mackintosh, who was engaged in the extraction of natural dyestuffs for textiles, was preparing ammonia for this purpose from urine collected in the City of Glasgow. It is to be presumed that he found this material somewhat variable for he provided his collectors with an instrumental means of rapidly testing the product. The instrument designed for this purpose still survives though its use has changed and enlarged; it is Twaddel's hydrometer.

A Very Wide Field

From these small beginnings, the analytical chemistry of textiles has grown until to-day it covers a very wide field, difficult to define, stretching from textile products themselves through the preparation of the artificial fibres, into the heavy chemical and dyestuff industries, and embracing the great variety of chemical products generally known as 'Textile Auxiliaries', of which alone some thousands are in production. As it was therefore impossible in limited space to give anything approaching a survey of this field, Mr. Hamlin proposed rather to illustrate its complexity by examining the progress of one fibre, cotton, from raw material to finished article, and to indicate the part that analytical chemistry had to play. The principles are largely similar for other textiles.

As a raw material, cotton fibre offers little scope for the analyst. The essential component, the cellulose forming the structure of the fibre, represents 93-96 per cent of the dry weight, the residue being formed essentially of about one per cent each of protein, pectin, and ash, and one half per cent of wax. None of these, except the wax, which happens to be present in about the correct quantity, affects the dry-processing of the fibre, and, therefore, none is normally determined. Impurities are adventitious non-fibrous materials and are determined mechanically by a process akin to winnowing (**1**).

Moisture Content Important

Cotton, and indeed most fibres, have one very important analytical characteristic and that is their moisture content, or, as it is normally expressed, their regain (percentage moisture expressed on the dry weight of fibre). The regain varies continually as the relative humidity of the atmosphere changes—for cotton at 24° C it is 3.6 per cent at 20 per cent RH, and 9.9 per cent at 80 per cent RH—and it also varies slightly with the temperature. In commerce fibres are sold at a standard regain and for this purpose the regain is normally determined by drying in an oven at 110° C, none of the more elegant techniques being competitive in respect of economy of working time or of equipment, as the determinations are frequently required in great numbers. For process control, however, more rapid methods are required. The regain may be effectively determined by measuring the electrical resistance of a pad of fibres compressed against a special electrode (**2**), the resistance change being approximately 2.8 times for each one per cent change in regain. Under mill conditions, however, the commonest method of adjusting weights of material in process is to observe the relative humidity and to obtain the regain from suitable tables. Unfortunately the absorption and desorption of water by cellulose is not reversible, but exhibits a hysteresis effect so that the result may be in error by an amount of the order of one or two per cent, depending on the direction of change of relative humidity. An ingenious instrument designed to overcome this difficulty consists essentially of a damped balance on which a specially constructed piece of cloth is counterpoised. As the

regain of the cloth alters, the balance point of the instrument changes, and the scale is calibrated directly in per cent regain (3).

Until recent years, the spinning process, whereby the fibres are converted into yarns, has offered little scope to the analyst, as it involves no chemical treatment. The position is somewhat different in the case of wool for here a considerable amount of oil is added to the fibre, and a knowledge of the quantity present is of some importance. Much ingenuity has been devoted to this problem, and in particular a simple elution taking about 10 min. is stated to give results agreeing closely with conventional Soxhlet extraction (4). Increasing interest in antistatic dressings for synthetic fibres may soon require similar methods in cotton spinning when mixtures of these fibres are in process.

Synthetic Fibres

The major change that has occurred in spinning has been the increasing use of synthetic fibres, either spun alone on the cotton system, or mixed with cotton. The various natural fibres are sufficiently distinguished by appearance and staple length to make their identification fairly simple, and the estimation of the proportions present in a mixture is possible by simple chemical separation or by microscopical counting. Synthetic fibres, however, with uniform appearance and arbitrary staple length have necessitated the development of chemical methods of identification. A particularly comprehensive scheme has recently been published dealing with both natural and synthetic fibres (5). The synthetic fibres are divided into six groups by their responses to tests for thermoplasticity, nitrogen, and chlorine, and the groups are then subdivided by solubility differences, the identity of each member being confirmed finally by simple chemical tests. The success of the method depends upon the extraction of a pure sample of the fibre, and this may not be easy from yarns containing two or more constituents. In this case microscopical observation of the effect of solvents on the constituents of the mixed yarn is a possible means of identification.

The densities of textile fibres are fairly evenly distributed over the range 1.14 (nylon) to 1.72 (calcium alginate) and methods of identification based on this fact have been proposed. If a measuring cylinder is filled carefully with progressively varied mixture of xylene and carbon tetrachloride, an almost linear variation of density may be obtained from top to bottom. Samples of unknown fibres may then be dropped in, and their densities assessed by noting the level at which they come to rest (6).

Yet another test that may be used for identifying synthetic fibres is the characteristic temperature at which they show a sharp contraction (7).

The quantitative separation of the identified fibres may be made by an adaptation of the density flotation method (8), but normally it is made by simple solution of one or more of the components. Originally most schemes were based on the insolubility of protein fibres in 80 per cent sulphuric acid, in which cellulosic fibres are soluble (9). The emergence of the synthetic fibres has upset this procedure, however, and now protein fibres are dissolved from all others by means of sodium hypochlorite solution (10). Frequently a choice of solvent for a separation is obvious but it is interesting to note that reduction of the molecular weight of cellulose during rayon manufacture allows rayon to dissolve in 59 per cent sulphuric acid in which cotton is insoluble. Another interesting example is the separation of wool and protein rayons after specific destruction of the cysteine cross links in wool (11).

Starch Paste Size

The weaving process embodies the first chemical addition to the yarn in the form of size, which is applied to the warp of the cloth to reduce breakage in the loom. The size is normally a starch paste containing an emulsified fat as a softener, and the quantity present may be determined by a variety of processes designed to hydrolyse the starch but not the cellulose. It is important to prevent microbiological growth in the abundant food supply represented by the starch, and antiseptics are commonly added. Of these the oldest is zinc chloride but this has now largely been replaced by salicylanilide (Shirlan). The small quantities of this antiseptic that are used are conveniently estimated, after extraction with borax solution, by the Gibb's reaction.

Most treatment of the cloth after weaving is chemical in nature. The first stage is the removal of the size which is commonly

achieved by acidic or enzymatic hydrolysis of the starch. The increasing use of sizes not based on starch, such as carob bean gum, tamarind seed powder, carboxymethylcellulose, and other synthetic sizes is creating a demand for methods of identification as failure to remove size completely can adversely affect the quality of the finished cloth. Generally speaking the most difficult problem is the detection of plant gums in admixture with starch, with which they are chemically closely allied. Some success has been achieved by paper chromatography of a solution prepared by acid hydrolysis of the sample. Starch gives only glucose while raw cotton may yield glucose and small amounts of arabinose and galactose. Any gum yielding other sugars should therefore be identifiable, and, in fact, as little as one part of carob bean gum in nine parts of starch has been detected by chromatographic separation of its characteristic structural unit, mannose.

The Scouring Process

The desized cloth is next subjected to the scouring process which consists of various forms of treatment with hot alkaline solutions, the purpose of which is to remove non-cellulosic constituents from the fibre. The determination of most of these non-cellulosic constituents has been considered as a means of assessing the effectiveness of this process, but in practice the determination of residual fat or wax is of greatest importance. The fat or wax present is determined by normal Soxhlet extraction and in cases where its removal by scouring is found to have been unsatisfactory, examination of the extract for abnormal constituents is desirable. The natural fat and wax of the cotton is a complex mixture which has been somewhat extensively investigated (**12**), and it is known that neither this, nor added fat, are much changed qualitatively on scouring so that the residual matter may be taken as representative of the original material. The residue even from an unsatisfactory scour will, however, rarely exceed 0.5 per cent and micro methods are a necessity.

A 2 ml. microburette that has proved very serviceable in this respect has recently been described (**13**). Acid values, ester values, and iodine values are determined on 19 mgm. samples by conventional methods straightforwardly reduced in scale, while a simple micro adaptation of the Verley Bolsung procedure has proved satisfactory for the determination of acetyl value. The determination of unsaponifiable matter on the 10 mgm. scale is, however, very unsatisfactory when conventional methods are used, and from current work it appears that chromatographic techniques may be of service here.

(To be continued)

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Texaco's Building Plans

THE Texas Company is to construct three new buildings to be completed in the spring of 1956. The programme plans for two new buildings at Texaco's largest research centre at Beacon, NY, and one at the company's largest refinery at Port Arthur, Texas. At Beacon the buildings will be an analytical testing station and an extension to the administration building. The Port Arthur, Texas, refinery will have a new analytical and testing station.

Mr. Augustus C. Long, president of the Company, said when announcing the project: 'Research occupies an increasingly important place in the everyday conduct of our business and in our long-range planning. It is the key not only to improved products and processes, but also to increased efficiency and reduced costs'.

Government Sells Rubber Plant

The US Rubber Facilities Disposal Commission announces that it has arranged to sell the Government-owned synthetic rubber plant at Baytown, Texas, to the United Carbob Company for £2,554,640. The plant is the 25th synthetic rubber facility the Government has sold.

IN THE EDITOR'S POST

Lessons from ACHEMA

SIR,—Having returned to England after visiting the ACHEMA Exhibition in Frankfurt, and being in attendance at my company's stand, to read your editorial entitled 'Lessons from ACHEMA' is to see in print an expression of one's own first-hand reactions. I know of no other exhibition which offers sufficient inducement for the attendance of visitors from every European country in such numbers as to warrant the attendance of every one of my company's European agents and to justify their attendance at our stand for a number of days.

In electing to take space at the 1955 ACHEMA, the primary consideration was that it was perhaps the only place where we could expect to hold such an international gathering. Much more than this have we achieved: the interest shown in our products from Germany alone itself has made our exhibit worth-while. With years of experience behind them in producing the highest quality scientific glassware, few Germans had any idea that a British manufacturer was in production with industrial glassware of a size and range exceeding theirs and backed by greater practical experience.

The Q.V.F. Ltd. stand had five working exhibits, one being an evaporator working under reduced pressure using steam as a heating medium. This was one of the rare truly working exhibits of the fair, another being on the stand of the Electrothermal Engineering Company, again using QVF glassware.

In view of the tremendous interest in our exhibit shown by visitors from the 48 countries registered to attend, I feel that this effort by a British manufacturer in competing with the German glass industry on its home territory would have been worthy of special mention in your editorial.

If you feel, as you surely must, that British manufacturers cannot afford to overlook the prestige value of the ACHEMA, then some reference to 'the few' who ventured there might not have been out of place.

Yours faithfully,

B. H. TURPIN,
Managing Director,
Q.V.F. Ltd.,
Stone, Staffs.

Editor's Note: We are grateful to Mr. Turpin for his letter reminding us that we had not sufficiently praised the dozen British firms who exhibited at the exhibition. In our issue of 21 May we mentioned that all of the UK exhibitors to whom we spoke at Frankfurt had been well pleased that they had participated in ACHEMA XI but we did not make the very important point that these firms did a great service to British industry.

At Frankfurt, for instance, several English speaking Germans and other foreigners told us that that they had never seen more interesting displays than those staged by Q.V.F. Ltd. and The Atomic Energy Authority of Great Britain. A Belgian expressed the opinion that these were the most interesting exhibits in the entire exhibition for while one German firm was introducing a very exciting new product they were not prepared to talk about it whereas the British firms were giving all the information required. He volunteered the opinion that if British firms took a block of stands all together in one hall it would have given visitors a better idea of the excellence of the British industry.

The firms which took part in the Frankfurt exhibition were The Atomic Energy Authority, W. Edwards & Co. (London) Ltd., Electrothermal Engineering Ltd., Enamelled Metal Products Corporation (1933) Ltd., Evans Electroselenium Ltd., Hilger & Watts Ltd., Joberg Ltd., Langley Alloys Ltd., Marchon Products Ltd., W. G. Pye & Co. Ltd., Q.V.F. Ltd. and Unicam Instruments Ltd.

International Congress

THE 28th Congrès International de Chimie Industrielle will be held in Madrid from 22 to 31 October. This congress is of great importance and nearly 2,000 are expected to take part.

Altogether there are 23 sections, including Corrosion and Protection of Materials, Nuclear Chemistry, Textiles-Cellulose-Paper, Plastics and Rubber, Paints and the Chemistry of Sols. There will also be a number of visits to laboratories and other places of interest in and around Madrid.

All inquiries concerning the congress should be sent to le Comité d'Organisation, Serrano 150, Madrid, or to la Commission permanente d'Organisation des Congrès de Chimie Industrielle, 28 Rue Saint-Dominique, Paris 7.

Ion Exchange Resins

Some Industrial & Therapeutical Applications

INFUSIBLE and insoluble polymeric resins having polar groups capable of ionic reactions have found important uses not only in industrial processes, but also in medicine. Added to their many useful applications, is their ease of regeneration, rendering them economical in function.

Their many industrial uses include the softening of hard water, purification of sugar juices, deionising of liquids, electrodialysis, the absorption of acid vapours and finally the selective separation of organic compounds and their derivatives. Using polar resins separations have been effected on adenosine and its mono-, di-, and tri-phosphates and choline and its esters.

In the recovery of sucrose from sugar cane and beet, inorganic salts are known to adversely affect the process, while the presence of calcium ions tends to cause undesirable scale in the evaporators. To minimise such effects, raw sugar juices, after clarification with lime, have been passed in alternating manner through beds of cation and anion exchange resins, the salt content of the fluids being thereby gradually reduced.

Using this method however reveals some disadvantages. Utilising cation materials having strong polar groups, as for example the sulphonates, may effect some inversion of the sugar, this depending to some degree on (i) the area of contact and (ii) the time of contact. Regeneration with such acids as sulphuric acid furthermore precipitates calcium sulphate, and the process may often require a two-stage regeneration, involving treatment with alkali and acid.

Carboxy Groups Used

To obviate such undesirable features, cationoid resins having weak polar groups, e.g. carboxy groups, have been utilised. Such resins therefore minimise calcium precipitation, and in addition involve only weak acids for their regeneration. Acrylic acid-divinyl benzene copolymers have been employed for such purposes, those resins containing higher proportions of acrylic acid to cross-linking agent finding application. Copolymers containing 90 per cent of acid monomer indicate the polar groups extant in the resin (*1*).

Sugar solutions may then be passed through a bed containing the weak cation exchange resin, followed by a smaller bed containing a more polar resin, and then finally increasing the *p*H of the solution, by passing the contents through a bed of anion exchange resin.

The degree of cross-linking in ion exchange resins is of importance, because a high gel content may imply difficulty of penetration by larger ions, so impairing the efficiency of the resin.

Molasses Purification

Molasses may be decolourised by passing the syrups over aqueous gels of aromatic-aldehyde resins, such gels containing sufficient water to give closed pack gel granules having a weight/volume ratio not greater than 400 g. per litre. The non-sugar ingredients of dilute Cuban black strap for example have been reduced from 40 to 15 per cent, utilising such resins (*2*).

Sugar solutions have also been decolourised using beds composed of a cation exchanger comprising a sulphonated product of coal and an aniline-formaldehyde resin, the resins being deposited on a layer of sand. In decolourising processes, porosity is an important factor.

The newer type chelating resins prepared by the polycondensation of formaldehyde, resorcinol and pyrogallol carboxylic acid can be used for the removal of calcium ions present in molasses containing an excess of alkali salts. Such chelating resins also show selectivity at given *p*H's; at low *p*H's, resins containing the *o,o'*-dihyroxy-azo-grouping chelate copper, and in buffered solutions of *p*H 3, magnesium may be separated from copper, using a 10 cc. column of resin. The copper may be eluted with hydrochloric acid. Using resins prepared from *o*-nitrophenol, resorcinol and formaldehyde, copper can be separated from calcium at *p*H's around 5.5.

The temporary hardness of water has been removed utilising phenolic cation exchange resins, prepared from resorcinol and formaldehyde. These resins by virtue of their hydroxyl content, show selective cationic activity, suitable for reaction with

the salts of weak acids; the resin gel before using is broken up and heated at 170° to 180° C at a pressure of 10 atmospheres, with sodium bicarbonate and water in an autoclave (*3*).

Sea water can be rendered potable by the aid of silver salts of the styrene-divinyl benzene sulphonate copolymers, applied in conjunction with the silver aluminosilicates (*4*). The organic resins possess the dual function of being disrupting agents as well as exchange resins; as disrupting agents the organic resins have proved superior to bentonite, the latter tending to impede filtering operations. The silver cation resins are usually incorporated in amounts from one to 10 per cent by weight of briquette, a typical recipe being as follows:

Silver cation exchange resin	1.3 g.
Silver aluminosilicate	62.3 g.
Stearic acid	0.8 g.
Activated carbon	0.2 g.
Barium hydroxide	3.5 g.

Other polar resins used in water treatment include those obtained from the polycondensation of phenol, a nitroalkyl urea and formaldehyde. The product is heat hardened and granulated before use. Such resins are claimed to remove alkali and metal ions, the resins forming insoluble salts with sodium, calcium, magnesium and lead (*5*). Other anion active polar resins involve polycondensations of the following combinations, thus urea/formaldehyde, aminotriazine/formaldehyde and biguanidine salt/formaldehyde respectively. An example of the absorptive capacity of their cured dried gels is that of the removal of 7,000 to 20,000 g. of calcium carbonate per cubic foot of resin.

The wet strength of felted fibres and paper may be improved by the use of cationic urea formaldehyde resins, suitable resins being obtained from the reaction of urea with formaldehyde and the appropriate polymethylene diamine.

Porous sheets of use in electro-dialysis may be obtained from heat cured resins prepared by condensing together phenol, formaldehyde and sodium metabisulphite, in the presence of water, alkali acting as catalyst. The degree of cross-linking will contribute to the separation of the ions, the smaller ions being more readily separated from the larger ions, due to the ease of penetration of the former into the resin matrix. The number of polar groups present will again affect the quantitative separation of the ions, due to initial reactions between the ion and resin.

Liquids have been successfully deionised by incorporating polar resins into natural and synthetic rubber films. Polyisobutylene and polythene have been used in such applications. The products swell in liquid media, thereby increasing area of activity of the resin; at the same time the selectivity of the resin is reduced (*6*).

Polyquaternary resins prepared from tridimethylaminoethylamine and a polymethylene dihalide have been successfully used for the absorption or removal of acids or acid vapours.

'Popcorn' resins, so called because of their resemblance to the blow cereal, and of use in sodium reduction therapy, have been prepared by 'seeding' emulsion polymerisation recipes of methacrylate esters and such diolefines as butadiene or isoprene.

The oedema often resulting from cardiac valvular insufficiency causing a back venous pressure from the vena cava, is not easily dispersed due to the presence of sodium ions. Using cation exchange resins with free carboxyl groups, this condition is ameliorated. Such resins may furthermore be a useful adjunct in treatment involving extension of the systolic period of the heart, incurred by lactone administration.

The proliferous polymers should have a high proportion of carboxy groups for an efficient ion exchange mechanism, and successful proliferous copolymers have been prepared using 147 parts of redistilled methyl methacrylate and 3.4 parts of the cross-linking agent divinyl benzene. In practice, the free radical catalysts are kept below 0.5 per cent by weight of total monomers, since the presence of larger amounts of free radical catalyst favours the formation of vitreous polymers.

Cross Linking Reduced

These polymerisations are preferably carried out under anaerobic conditions; in such copolymers the degree of cross linking is reduced so facilitating the formation of head-tail copolymers, capable of forming around each other in a manner similar to crystal formation from saturated solutions. Solvation of these concentric copolymers affords a dispersable medium, suitable for medicinal application. Highly gelled products ulti-

mately giving granular and gritty materials, would be unsuitable for such purposes (7).

In acute gastritis where the curtailment of stomach acids is desirable, ion exchange resins have found application. Their general insolubility in the media in which they function, precludes the possibility of contamination and possible toxic side-effects due to absorption into the system.

The eluant is sometimes of importance in ion-exchange mechanisms, particularly when elements exhibit the same complexing characteristics with a ligand. Thus iron and palladium are separated with difficulty using solutions of hydrochloric acid, but as Kraus and Moore observed, by analogy with the adsorption phenomena of protoactinium in HCl-HF mixtures of high HCl concentration, iron and palladium can be successfully separated by using polystyrene-divinylbenzene resins and such mixed eluants (8).

Such a technique envisages the separation of iron from hafnium and niobium, and may well be of value in the extraction and isolation of such rare elements from suitable gangue. Using lithium chlorine and a quaternary amine-polystyrene-divinylbenzene anion exchange resin, the separation of beryllium from alkali metals has been suggested. (9).

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NIFES's First Report

Substantial Fuel Savings

GREAT Britain must face up to the fact that it has a deficiency of energy sources. This point is made clear by the First Progress Survey of NIFES (National Industrial Fuel Efficiency Service). It is estimated that by 1962 the deficit will reach 20,000,000 tons, and the need for fuel conservation is readily evident.

Although it has only been in operation for 11 months NIFES has already done valuable work in a wide variety of industries. A large paper mill, for example, will save 4,795 tons of fuel a year (32 per cent of its annual fuel consumption) by carrying out the recommendations of NIFES' engineers. With little capital expenditure a firm of bleachers will be able to cut the steam consumption of two stenters by 63 per cent, a saving of 590 tons of coal a year.

NIFES, which is a non-profit making organisation, is at present on a fairly sound financial basis as it can draw £259,000 per annum from the National Coal Board and £100,000 each from the Gas Council and the Central Electricity Authority.

One of the greatest difficulties in many fuel economy schemes is the great expense involved, and many industrialists are unable to raise the necessary capital. For this reason the Government will offer loans to suitable firms to enable them to carry out the alterations required. The loans are normally repayable over five years at commercial rates of interest.

'How much fuel has been saved?' is an apparently simple question to which there is no simple answer. It often happens that instead of decreasing his fuel consumption as a result of NIFES recommendations, the manufacturer increases his production. Indeed in one case a firm has reported that as the result of a fuel economy campaign there has been an improvement in overall fuel economy, while coal consumption has actually increased instead of being reduced. Making allowances for this type of case it is estimated that a saving of well over 1,000,000 tons a year can be made.

Czech Plastics Exhibition

THE progress that Czechoslovakia has made since the war in the plastics industry was shown at an exhibition last week in London. Organised by East Anglia Plastics Ltd., British agents for Chemapol of Prague, it showed the raw materials now being produced in Czechoslovakia, together with articles made from them.

When the war ended Czechoslovakia had to import all raw materials for its plastics industry. To-day the country exports plastics materials to many parts of the world.

A special exhibit was Sanplast, a vinyl based thermoplastic sheet used for making splints and other surgical appliances. Sanplast can be shaped with precision on the affected part, and sets rigidly. A patient wearing a Sanplast surgical appliance, it is claimed, can bath without having to remove it.

New Aluminium Coating

Non-Toxic, Odourless Material

A NEW aluminium dampcoating product has been developed by Xzit Chemical Company, of Hoboken, US, for engineers and maintenance personnel faced with the problem of applying effective corrosion preventatives to dark surfaces which are damp, wet or sweating.

For some 15 years the company has been manufacturing a protective coating called Serviron—a black, permanently soft, self-healing, viscous coating material. The non-toxic, odourless Serviron was designed for the protection of submerged and exposed steel surfaces which undergo severe corrosion—for these functions it proved ideal. It was used successfully on water tank interiors, underground pipe lines, piers, ships' hulls, subways and deck machinery.

'Holidays' Left

However, Xzit were frequently asked why the coating was manufactured only in one colour. Engineers often found the black material hard to apply without leaving 'holidays'—surface areas that had been missed. The dark surface made inspections difficult and painters wanted a lighter, more pleasant colour to work with.

After years of research Xzit tried aluminium pigments which, being non-toxic, highly reflective, durable and moisture resistant, were ideally suited to their needs. Aluminium Serviron was produced after months of development and testing work by Xzit and the Aluminium Company of America, suppliers of the pigment.

Marketed only recently, this new dampcoating material has proved extremely successful. Non-toxic in all respects, it is ideally suited for coating drinking water tanks. Its bright colour facilitates inspection in poorly illuminated areas such as ships' tanks.

To apply Aluminium Serviron all surfaces should be cleaned of oil, grease, loose dirt and foreign matter. The coating can then be sprayed or brushed. If sprayed, it should be heated to 180° for maximum coverage and ideal coating thickness.

Aluminium Serviron is manufactured in Great Britain by Xzit (GB) Ltd., of 175 Piccadilly, London W.1.

Sugar Technology

AN EXPERIMENTAL sugar factory is used by students at the Imperial College of Tropical Agriculture, Trinidad, for the study of sugar technology. Modernisation of this factory has recently been completed and a 30 in. high speed centrifuge acquired.

The report for 1954 of the college says that important advances have been made both in the fields of sugar technology and in by-products. Extensive tests have shown that Versene can be used to remove the scale from the sugar evaporators. A side issue of this work is the elaboration of a new method of determining zinc polarographically.

Dry crystalline glucose and fructose have been prepared from sucrose in the laboratory and subsequently on the pilot plant scale. A new method has been evolved for determining the solubility of sucrose; the results obtained agree with those of Taylor and Herzfeld.

Samples of paper have been made from bagasse and sent to the UK for examination. Preliminary results indicate that paper of good quality can be made from this source. Fundamental chemical studies on cellulose and xylan from bagasse are being made.

The preparation of ammoniated molasses has been studied and about four tons of the material have been made on the pilot plant scale. Chemical investigation has shown the presence of two important groups of organic compounds. There are also indications that this material will be of value in cattle feeds.

Electrical Convention

'RECONNAISSANCE into only partly charted territory is usually tempting, often dangerous, but always stimulating,' said Sir Harry Railing, the president of the British Electrical Power Convention, at a press reception held on 3 June. The convention, which is to be held in Brighton from 27 June to 1 July will be such a reconnaissance.

As well as a wide range of exhibits by manufacturers of electrical equipment and appliances, a number of papers will be read. Among these will be 'The Use of Electricity in the Steel Industry' by W. F. Cartwright, and 'The Use of Electricity in the Chemical Industry' by G. Nonhebel, of I.C.I.

Indian Newsletter

FROM OUR OWN CORRESPONDENT

INAUGURATING the Development Council for Heavy Chemicals (Alkalis) in New Delhi, the Deputy Minister for Commerce and Industry of the Government of India said that 10 new schemes for the manufacture of caustic soda were expected to be completed within the next two or three years, raising the annual capacity from about 42,000 tons to 106,000 tons. Three new factories for the manufacture of soda ash with a total daily capacity of 520 tons had been licensed and were expected to be set up shortly; the two existing units had already expanded their capacity so that even at present the daily capacity stood at 260 tons. It was pointed out that targets that might be fixed for industries like rayon, dyestuff and plastics in the second Five Year Plan could be realised only if there was a significant increase in the production of basic alkalis. It was also stated that a stable bleaching powder plant with a capacity of 540 tons per month is being installed by a chemical firm in Madras State.

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According to the Planning Commission, the production of ammonium sulphate in the Sindri fertiliser factory during April-September 1954 was 135,000 tons as against 128,000 for the corresponding period of 1953. The coke-oven plant, started last year, has reached the production target of 600 tons per day making Sindri self sufficient in regard to its coke requirements. The construction of the by-product benzol plant has been completed and it is expected to be commissioned shortly. The Government of India have approved the expansion programme to produce 70 tons of urea and 400 tons of ammonium sulphate—nitrate mixture per day by utilising the entire quantity of 10,000,000 cu. ft. of gas from the coke-oven plant. It is learnt that an Italian firm has been given the contract for the installation of the plants. The project is expected to cost Rs.10,000,000 (£750,000). To meet the growing need for fertilisers in India, an operational agreement has been signed between India and the United States for the supply of 55,500 tons of fertilisers to India. The Government of India have also appointed a Fertiliser Production Committee to make recommendations for the creation of an additional capacity of 170,000 tons of nitrogeneous fertilisers per annum.

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A new process has been reported for the production of ether by the catalytic dehydration of ethyl alcohol in a fluidised catalyst bed. Developed at the Sri Ram Institute of Industrial Research, Delhi, and covered by an Indian patent, the technique of vapour phase catalytic dehydration of alcohol at 200-300° C with bauxite as the catalyst, gives a conversion of 43 per cent. It is claimed, on a pilot plant with a capacity of 60 lb. of alcohol per hour, that corrosion and the production of by-product ethylene are minimised. The crude ether is purified as usual. India now produces about 400,000 lb. of ether per annum. In this connection it might be of interest to note that the All India Distillers' Association at their recent annual meeting urged the expansion of the power alcohol industry in India for the economic utilisation of surplus molasses and for producing liquid fuels.

* * *

The annual requirements of dyestuffs in India are currently estimated at 22,000,000 lb. The Minister for Commerce and Industry of the Government of India told the Indian Parliament that the Government have decided to establish a fully-fledged dyestuff industry in the country including the manufacture of intermediates. The Government had three concerns in view who could start production of dyestuffs and will evolve a scheme with a view to utilising the waste gases of oil refineries and steel factories. The Minister also revealed that three Bombay firms, Messrs. Popatlal Ghalalbha & Co., Eastern Chemicals Ltd., and Indian Electrochemicals Ltd., had been sanctioned licences for starting sodium hydrosulphite plants. The plants were expected to go into production sometime in the next year.

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British manufacturers are very keen on establishing a steel plant in India in collaboration with the Government and private enterprise. It has been remarked in several circles that Britain ought to have been first in the field to set up a steel plant rather

than allowing the Germans and the Russians to contract for two plants already. However, the eight-member British Steel Mission (led by Sir Eric Coates) arrived in India recently and had consultations with the Government and concerned parties. The mission visited West Bengal in connection with choosing a site for the location of the plant. It is, however, learnt that Durgapur in West Bengal is taken for granted as the site of the new plant. The mission is reported to have reached agreement with the negotiating Committee of the Government of India on the end products of the new steel mill and other details. It is not deemed necessary to invite global tenders for machinery and plants as British manufacturers have offered credit facilities. In the case of the Russian sponsored plant, for which Bhilai in Madhya Pradesh has now been chosen as the site, Russia offered credit facilities and consequently arrangement was reached between the Governments. In the case of the Rourkela plant developing with the assistance of the German combine, the Government of India propose to pay cash for whatever plant and machinery they may purchase and hence global tenders will be invited.

* * *

Foundation was laid in Bombay for the research institute of the Silk and Art Silk Mills' Research Association. This is the second research institute to be formed by the industry in co-operation with Council of Scientific and Industrial Research. The Institute is estimated to cost Rs.2,000,000 (£150,000) and to be completed in two years. It will have five divisions of which one will be a chemical and physical testing laboratory and the other will be for imparting training in the latest methods of technology.

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Waste mica available in large quantities in India has been made use of in the preparation of insulating bricks used as backing material in the construction of furnaces. These have been made at the Central Glass and Ceramic Research Institute at Calcutta and compare in properties and performance to vermiculite bricks. The bulk density in lb./cu. ft. is 44 for mica bricks and 47 for vermiculite bricks; crushing strength lb./sq. in. mica bricks 150; vermiculite bricks 125; conductivities (B.T.U.) are respectively 1.38 and 1.35. The process is covered by an Indian Patent and is available for exploitation through the National Research Development Corporation, New Delhi.

They Asked Berk

'ASK BERK' is the slogan painted on the 40 distinctive yellow tank wagons operated by F. W. Berk & Co., the chemical manufacturers and merchants. That there has been response is revealed by the chairman's statement at the recent AGM at Commonwealth House, New Oxford Street, London.

Sales of the company expanded by more than 30 per cent and the improvement was spread over both manufacturing and merchanting operations. The notable expansion was in the fine chemical operations carried out at Sanderstead, Surrey, where business so increased as to force overflow arrangements to be made at Park Royal which proved inadequate so that negotiations had to be started to buy a factory at Sandridge, Herts.

The growth of some sections of the Berk organisation appeared to have no infant stage. Early in 1954 the company held 48 per cent of the shares in the Abbey Chemicals Ltd., a new company formed with an authorised capital of £100,000 in conjunction with the Hoyt Metal Co. of Great Britain to make bentone and lead chemicals. Development was so rapid that bigger office accommodation had to be found to deal with the increasing business.

The profit of the Berk Company for 1954 was £374,796 as against £241,440 in 1953, before charging taxation. The directors recommended the payment of a final dividend of 4½d. which, with the interim dividend of 1¾d. paid on 13 December, 1954, will make a total of 6d. per share for 1954.

'Dunlop in Malaya'

'DUNLOP in Malaya' is the title of a film made to show Dunlop employees in Britain and overseas the way of life and the work done by their colleagues in Dunlop's 13 rubber estates which cover an area, centred on Malacca, the size of the County of London.

The film was made by the Malayan Film Unit and produced by Ronald H. Riley in association with the Film Producers' Guild.

The Effects of the Strike

AS the strike of British railwaymen neared the end of its second week the situation, so far as the chemical industry was concerned, threatened to become more serious. At the time of going to press, however, there were no reports of any plants having to drastically reduce production or of labour being laid off. Most of the companies appeared to be managing to maintain reasonably full production. In the heavy chemicals field, however, it was stated that if the strike continued into the third week some plants would have to reduce output and eventually some workpeople might have to be stood off. Supplies of fuel appeared to be sufficient to last for from three to four weeks in most cases, but some firms were beginning to worry about their supplies of raw materials. This was particularly the case with certain imported materials such as sulphur, but this was largely due to the dock strike. As a matter of fact many firms were of the opinion that the dock strike was hitting harder than was the strike of the railway footplatemen.

Panel for Flour Review

THE Panel formed to review and determine the differences in composition and nutritive value between national flour as defined in the Flour Order (1953); flour of extraction rates less than national flour as defined in the Order to which three token nutrients have been restored; and flour of extraction rates less than national flour as defined in the Order to which three token nutrients have not been restored, has had its first meeting.

Formed by Lord Adrian, President of the Royal Society, at the request of the Rt. Hon. D. Heathcott Amory, Minister of Agriculture, Fisheries and Food, the Secretary of State for Scotland, and the Minister of Health, the Panel comprises: Professor Sir Henry Cohen, M.D., F.R.C.P., J.P., Professor L. J. Witts, D.M., F.R.C.P., Professor J. H. Gaddum, Sc.D., M.R.C.S., L.R.C.P., F.R.S., Dr. A. C. Chibnall, Ph.D., Sc.D., F.R.S., and Professor R. A. Morton, Ph.D., D.Sc., F.R.I.C., F.R.S.

The panel invites persons or organisations to submit written evidence to its secretary: Miss B. Shedden, 10 Whitehall Place, London S.W.1.

New Stabilised Rosin

A FREE-flowing form of stabilised rosin, promising greater ease of handling, has resulted from research performed at Battelle Institute, Columbus, Ohio. This rosin composition remains free-flowing because it has been pelletized and treated with a special conditioner.

Various forms of rosin are used in rubber compounding, varnishes, paper sizing, and many kinds of pressure-sensitive adhesive tapes. At present it is shipped in steel drums as a solidified mass which is chopped into small pieces for use. The new free-flowing form can be shipped in paper bags or fibre drums, as well as steel drums, and can be poured from the container. The pellets will not fuse at temperatures up to 54° C; neither will they cake under pressure when bags of the material are stacked for storage. The composition, based on an iodine-disproportionated rosin, is also stabilized against deterioration through oxidation.

Known as Galex Pellets, the new form of modified, free-flowing rosin will be produced by the G and A Laboratories, Inc., Savannah, Georgia, who sponsored the research at Battelle. Sole sales distributors will be National Rosin Oil Products, Inc., New York City.

Steel Prices

The Iron and Steel Board announce that changes have been made both upwards and downwards in the maximum prices of certain non-alloy steel wire rods to size.

Examples of basic prices applicable to rods 3 gauge to 4/0 gauge are:—

	Old Price £ s. d.	*New Price* £ s. d.
Soft Basic Quality delivered to		
Birmingham	31 17 3	31 17 3
Scotland	31 17 3	32 4 9
Southern Joint Area	31 19 9	32 4 9
All other areas	31 14 9	31 9 9
Ordinary Acid Quality delivered to		
Birmingham	42 11 3	42 13 9
Scotland	42 11 3	43 1 3
Southern Joint Area	42 11 3	43 1 3
All other areas	42 11 3	42 6 3

The changes result from further rationalisation of the price structure of the industry.

The new prices came into force on Monday, 30 May, 1955.

Quebec Lithium Expansion

THE Quebec Lithium Corp., which plans to be Canada's first lithium producer, probably before the end of this year, recently reported that it had received a further $675,000 through an underwriting on 50,000 shares at $13.50 a share.

A five-year contract with Lithium Corp. of America calls for Quebec Lithium to deliver 165 tons of concentrate daily. This can be obtained from treating about 800 tons of ore daily, but all basic items in the mine plant and underground facilities are being installed to handle at least 1,500 tons daily.

Consideration is also being given by Quebec Lithium's management to establishing a chemical processing plant in Canada. While the contract for the sale of lithium concentrates should prove highly profitable to the company, the big profit, it is felt, would be in the company's own chemical processing plant turning out finished lithium compounds and possibly lithium metal.

Since it should be possible for the company to produce much more than the 165 tons of concentrate contracted for daily, Quebec Lithium could use the excess production of concentrate for its own purposes.

Lithium carbonate, now selling at around 90 cents a pound, could be produced at about 25 cents a pound, according to preliminary calculations. Lithium metal, selling at about $12 to $13 a pound, would be produced at a cost of around $3 a pound. About seven pounds of metal could be produced per ton of ore.

British Enka Ltd.

LAST year British Enka Ltd. spent £342,215 on buildings, plant, and machinery at Aintree, Liverpool, and £250,000 on research. A member of the AKU group of companies, British Enka Ltd. is constantly engaged in research on viscose rayon yarns. It is also spending considerable sums in the textile field investigating new types, including high tenacity and other specialities.

The working profit of the British Enka Group for 1954 was £929,943, but there was a loss of £12,945 on the sale of plant stores for British Visada Ltd.

The net profit for the year was £305,777 and a dividend is recommended of 10 per cent, less tax, which will absorb £107,813, leaving a balance to be carried forward of £189,469. The directors have appropriated £275,000 for general reserve.

Three Company Merger

THREE companies—Baker Platinum Ltd., Hanovia Products Ltd. and Hanovia Ltd.—have been merged under the name of Engelhard Industries Ltd. All three companies will form specialist divisions in the Engelhard Industries.

Baker Platinum Ltd. refines and fabricates precious metals, produces dental gold and amalgam alloys, and platinum laboratory apparatus. Their address is: 52 High Holborn, London W.C.1, and they form the Precious Metals Division.

Hanovia Products Ltd. makes liquid gold and other liquid preparations for the ceramic trade. They form the Ceramic Division and their address is: 146 Vauxhall Street, Kennington S.E.11.

Hanovia Ltd. makes ultra and infra-red radiation equipment and they will form the Lamps Division. Their address is: Bath Road, Slough, Bucks.

Vitamin Deficiencies

WAR-TIME investigations carried out on volunteers indicated that the minimum daily dose of vitamin C necessary for the maintenance of health was 10 mg. This value is very much lower than the 30 mg. minimum estimated by the League of Nations Health Organisation and by the BMA's Committee on Nutrition. This discrepancy emphasises the difficulties inherent in this type of work.

According to the annual report (1954) of the Ovaltine Research Laboratories the true figure is a little higher than 10 mg. These laboratories are concentrating their efforts on problems of nutrition, in particular those concerned with vitamin deficiency.

In collaboration with other organisations the Ovaltine laboratories have been examining the nutritive value of a variety of foods, including cereals such as wheat and barley, yeast and yeast extracts, and meat products of different types.

Alternative Fuel Gases Sought

SCI Group Hears Mr. Henry Jones

SPEAKING at the annual dinner of the Chemical Engineering Group of the Society of Chemical Industry, which was held in London on Friday, 3 June, Mr. Henry Jones, M.B.E., Deputy Chairman of The Gas Council, revealed that an intensive search is going on in this country to find alternatives to coal as a source of fuel gas. The possibility of importing liquid methane was one of those being considered at the moment, he said.

The dinner, which was held at the Cafe Royal in Regent Street, followed the Group's annual general meeting and was presided over by Professor F. H. Garner, O.B.E., retiring chairman.

In proposing the toast, 'Our Guests', Professor Garner said there was an affinity between the Chemical Engineering Group and the gas engineering industry, in that both had a background of a strong manufacturing side. Just as on the chemical side the newer developments in the fields of solvents, plastics, fibres and synthetic resins were challenging the old ideas, in gas manufacture there were also some quite revolutionary developments in hand.

There had been an idea in some quarters that the gas industry was fading out; but very little thought would show that that was complete nonsense. He recalled having discussed, when in Pittsburg some time ago, the improvements made there in the condition of the atmosphere. It had been known as a smoky city, but now the atmosphere was fairly clear. That was only partly due to the introduction of smoke regulations in the burning of coal; it was due primarily to the availability of natural gas, because the supplies of smokeless fuels would not have been adequate.

Gasification Obvious Step

In the future, with the increasing development of atomic power, such natural fuels as petroleum and coal would become increasingly important as raw materials for manufacture; and in so far as coal was concerned, the first step was obviously that of gasification.

Mr. Jones, in his response, said that more than 27,000,000 tons of coal were carbonised at gasworks every year; and they would like to carbonise still more if they could get it. That quantity constituted about 12½ per cent of the country's output of coal; and in addition, about 500,000 tons of oil were used for gas manufacture. About 12,500,000 consumers were supplied, and more than a quarter of the gas was sold for use in industry. The income from gas alone amounted to £170,000,000, and the total income of the industry from all sources was almost £300,000,000 per annum. It employed more than 140,000 people and, in addition to gas, it sold coke, tar, benzole, ammonia, sulphur and a wide range of chemicals derived from those by-products; in fact the gas industry still provided the raw materials for an important section of the chemical industry of the country. It did not seem to him that atomic power would replace the traditional fuels; they would still be needed and in his view they would increasingly be converted into gas before delivery to the users.

Other Possibilities

Coming to the question as to whether the kind of gas that was being supplied now was the most suitable for distribution, he said one wondered whether, if we were not tied to coal, we should make gas in another way or from some other source. Obviously gases which, when burned, gave rise to noxious chemicals could not be considered, e.g., sulphuretted hydrogen. Undoubtedly any fuel gas would have to contain hydrogen, carbon monoxide, and a hydrocarbon. If we assumed that those gases were the inevitable constituents of a fuel gas we must, unless we could find an unlimited source of hydrogen, find a source of carbon from which the gases could be manufactured.

For various reasons coal gas was a very convenient mixture, from the points of view of flame speed, density, and so on. But The Gas Council did want to free the industry from being tied entirely to coal as a raw material; after all, its costs were related considerably to the price of coal. They were spending up to £1,000,000 over five years in the search for natural gas, and they were not without hope, especially when they heard

that in Italy, where there were very good supplies of natural gas, it had taken 12 years to find it. Again, The Gas Council were not entirely without hopes of importing methane in the liquid form. It was too early yet to say that we could ship methane across the ocean and economically deliver it in this country and supply it as towns gas, but it was worth looking at.

Discussing organic materials such as sewage as a source of carbon, Mr. Jones said he was told that the amount of methane which could be recovered from a sewage works was about 1 cu. ft. per person per day, or 1,000 cu. ft. per house per year. That source, therefore, could not keep the industry going. But a recent article in *Country Life* had described a 'gasworks' at a farm, the gas being provided by the fermentation of farmyard manure and being made available in sufficient quantities for cooking and some space heating, as well as for the power needed to generate electricity for lighting.

Methods of Conversion

In the absence of natural gas, the only sources of carbon now available in the quantities required were, of course, the fossil fuels—coal and oil. Processes for converting those fuels either partially or totally into gas were broadly of three kinds: carbonisation, which included both high and low temperature carbonisation of coal and could be regarded as including the thermal cracking of oil, the fuel being only partly converted to gas, leaving a carbonaceous residue together with tars and oils; gasification with air or with steam and oxygen to give a gas mainly composed of hydrogen and carbon monoxide; or hydrogenation, whereby hydrogen produced possibly from a gasification process was used to react with coal or oil to give a hydrocarbon gas. The ultimate result of adding hydrogen to a carbonaceous material was the production of methane, each carbon atom then having all the hydrogen atoms attached to it which it could hold.

A British development taken on by the South Eastern Gas Board was the Segas process of gasification, which would convert almost any kind of petroleum feed stock into towns gas. A similar process, developed abroad, and which used a catalyst, could do much the same thing. There was still a long way to go, but there was definitely something there.

On the coal side, perhaps the immediate likely development was the high temperature gasification process; but that was not the only line of approach. For dealing with coal there was the fixed bed type of process, like the Lurgi process; the moving burden; the fluidised approach; and also suspended gasification. The research programme of the Gas Council was largely directed towards discovering processes or developing known processes for the conversion of coal and oil into satisfactory fuel gases, and the work included the development of processes which could use the lowest grades of coal.

Some of the processes involved the use of oxygen in very large quantities, but he did not think its cost was a prohibitive factor if the scale were large enough. A cubic metre of oxygen should not cost more than a kilowatt-hour of electricity, and the volume of oxygen needed was much less than the volume of gas produced from the gasification process.

Contracting firms, doing their own research and development, were working happily with the Gas Council, and in the next five or 10 years there would be very great developments indeed in the field of gas manufacture in this country.

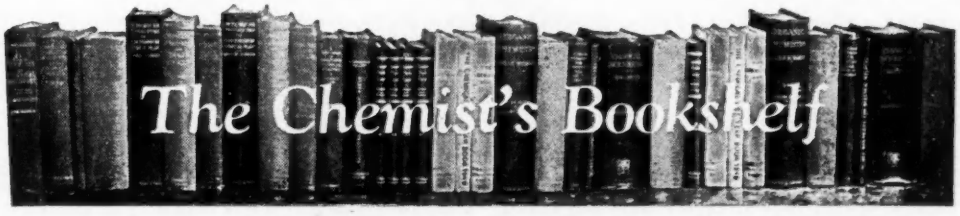
To Thresh Atomic Problems

THE rapid progress made in the technology of nuclear energy has brought scientists and engineers into close contact, and to enable them to discuss their problems the British Nuclear Energy Conference has been founded.

Formed by the Institutions of Civil, Mechanical, Electrical, and Chemical Engineers, and the Institute of Physics, the Conference will be managed by a board consisting of three representatives from each of the five societies.

The board will hold its inaugural meeting in the autumn when a symposium of lectures will be given on the technology of nuclear energy. It also proposes to promote national and international conferences from time to time.

The chairman is Sir Christopher Hinton, and Sir John Cockroft is a board member. The secretary is Mr. Alexander McDonald who is the secretary of the Institution of Civil Engineers.



THE TECHNOLOGY OF SOLVENTS & PLASTICISERS. By Arthur K. Doolittle. John Wiley & Sons, New York; Chapman & Hall, London. 1954. Pp. xv + 1056. 148s.

The classification 'Solvents & Plasticisers' is one that defies the academic chemist. While there has been a considerable amount of scattered literature in the past, the author has attempted within the compass of a single if bulky volume, to cover the basic physical chemistry of these compounds, with special reference to the use of organic solvents and plasticisers for resinous substances, and has also concentrated on the approach to these materials from the point of view of their applications. Thus in many ways the book is as valuable a contribution to the technology of cellulosic thermosetting, and vinyl resins as it is to that of solvents and plasticisers.

The book commences with a general survey of solvent and plasticiser utilisation, and in the first chapter only an indication is given of other uses of solvents such as dry cleaning, explosives, and vehicles for agricultural sprays. Only three pages are taken up by the fields of applications of plasticisers in this introduction, and a rather rigid distinction seems to be made between the two groups, although a section in a later chapter (ch. 15) does indicate that there is no real sharp distinction between solvents and plasticisers, and retention of the latter may depend on the operating conditions. Nevertheless plasticisers and plasticisation tend to be 'also rans,' as only one fifth of the book is devoted to them.

Chapter 2 is an introduction to the technology of solvents and briefly considers 'solvent strength.' The thermodynamic approach is rather premature here as a lengthy chapter is devoted to solvent action (ch. 14).

Chapters 3 to 8 all consider solvents from the point of view of the various applications in the resin industry. The section on nitrocellulose lacquers is a skilful blend of theory and technology, as is that on vinyl resins. There is a very profuse use of graphical representation, which is typical of the book as a whole. Besides the more conventional phase diagrams, there are numerous diagrams illustrating viscosity effects of different solvents. Solvent strength, solvent balance and evaporation phenomena are thoroughly discussed in reference to nitrocellulose, although the more general reader may have difficulty with the mathematical treatment. An attempt is made to deal with compatibility of different resins including a reference to the work of Dobry & Boyer-Kawenoki (*J. Pol. Sc.*, 1947) on phase separation which has been generally overlooked. A section on thinner formulation is included, as well as a number of miscellaneous formulations.

The chapter on vinyl resin coatings, describes, again with the profuse use of diagrams, the technology of the various resins in this field, but there is one fairly obvious defect, and that is the excessive use of trade names. As even the resins under the 'Vinylite' trade mark are now referred to as 'Bakelite' Vinyl resins, this may detract from the ultimate value of the book, especially outside the United States. It is assumed that the reader is familiar with most terms in lacquer technology, e.g., the term 'orange peel' is used without definition (p. 123). A competent discussion of organosols and plastisols is included, and also a few pages on synthetic resins latexes (latices?) although the author is already out of date in referring to styrene-butadiene as the basis of emulsion paints since even in the US polyvinyl acetate emulsions have made very strong headway, while they are almost universally used in Europe. The statement that the presence of plasticiser in latex systems often decreases stability is hardly justified.

'Convertible and miscellaneous finishes'

covers a considerable range of resins ranging from phenolics and acrylic resins to silicones, and their solvents, and also includes paint removers, and a further discussion on solvent strength.

Technology of application is an unusual division, and includes methods of preparing surfaces as well as techniques such as the familiar spraying, roller coating and intaglio printing. Safe operations of ovens where volatile solvents are released is stressed with a comprehensive table of explosive limits in air, flash points, auto-ignition temperatures and the threshold exposure limits. Equally the information on the handling of solvents is useful.

Having introduced solvents by way of their applications in the first third of the book, they are next discussed as an individual class of compounds in more than 100 pages of graphs and tables. Fourteen charts illustrate the relative evaporation rates of most common solvents, and the vapour pressures of the principal groups such as ketones, chlorinated hydrocarbons, etc. Physical properties of over 160 solvents are given in a comprehensive table which deals with properties of the industrially available materials, and includes a column of dilution ratios not too easy to follow. Data re azeotropes is often difficult to obtain, and the table given here is unusual in quoting all common mixtures which have no azeotropes, the latter information being extremely difficult to locate in the ordinary way as almost every industrial chemist of experience has discovered. Sections on the physiological action and some analytical methods conclude the chapter. It is to be noted that plasticisers are included with solvents in considering physiological action.

Discussion of the properties of individual solvents follows conventional lines, and the chapter is liberally strewn with graphs. One would like an original reference to the claim that methanol attacks aluminium and lead, and also steel in aqueous solution. Data regarding denatured ethanol, also occupying a considerable part of chapter one, are of restricted interest to the British reader. It is surprising to learn that there is no regular production of methyl acetate in the US. The more exotic solvents, such as many of the sulphur containing ones made during the war are not indicated.

Plasticisers tend to be somewhat the Cinderella of this volume. Definitions of primary and secondary plasticisers are given with a warning that they are relative terms, dependent upon the resin considered, not always nitro-cellulose, although in some places the text seems to assume that only highly polar resins are considered. The valuable work of the author himself on theories of plasticisation is quoted. Considerable practical data are included. Most of the common plasticisers are described briefly with their principal applications.

In addition to the early chapter discussing solvent strength Chapters 13 and 14 are devoted to the viscosity of liquids, and the theory of solvent action. Some of this material is rather advanced, but indicates how workers such as Andrade and Dr. Doolittle himself have attempted to elucidate the difficult theoretical problems of viscosity, and it is admitted that no completely satisfactory model analysis of Newtonian liquid viscosity has yet been advanced.

On the other hand many practical instruments for the measurement of viscosity have been devised, and most of the principal ones are described, the Ferranti viscometer being the most noteworthy omission.

It is easy to be critical of a volume of this type. Some may quarrel with the method of approach by way of the principal fields in which solvents are employed, and consider that there is too much data on synthetic and natural resins and their applications. It is fundamentally intended for US readers, and therefore to a large extent the references to trade names and manufacturers are only of little use in this country. Possibly the statement that the reviewer would question most occurs on page 4 when the author stresses the advantages of chemicals prepared synthetically over those derived from agricultural products. Although the latter are subject to much greater variation, they do, at any rate, represent an inexhaustible form of raw materials, whereas the world's petroleum reserves, and even coal reserves have only a finite life.

To sum up, although one may find some points of criticism, nevertheless the author has accumulated a wealth of detail which has not yet appeared in one volume in the English language. It is a most valuable addition to the bookshelf of any laboratory, and the high price should not prove any deterrent to its purchase.—H. WARSON.

• HOME •

Full Employment Slows Atom Research

The Atomic Research Establishment at Aldermaston, Berkshire, needs more scientists and laboratory assistants. The shortage is causing a problem, and each week advertisements go out for staff, but without success. The reason—full employment throughout the area.

Pyrene Offer

The Pyrene Company has made an offer to Minimax, the fire extinguisher manufacturers, of 16s. 3d. for each of the 600,000 issued 5s. ordinary shares conditional upon a 90 per cent acceptance until 22 June. Percentages and date are at Pyrene's option.

Atoms for Peace Message

In a message to the Anglo-American Atoms for Peace Exhibition which opened in London recently President Eisenhower said: 'The unlocking of the energy of the atom had given mankind a power for good that dwarfed any previous achievement in sciences'. The President's message was read by Mr. Winthrop W. Aldrich, US Ambassador in London, at the opening ceremony.

£2,000,000 Coke Oven

The Durham Divisional Coal Board has ordered a £2,000,000 coke-oven plant for Murton Colliery from Woodall-Duckham Construction Co. Work has begun and the project is expected to be completed by September 1958. The new coking plant, comprising 50 ovens, will produce 250,000 tons of coke a year. By-products will include sulphate of ammonia, tar, and crude benzol.

New Laboratory to Open

The new Water Pollution Research Laboratory of the Department of Scientific and Industrial Research at Stevenage is to be officially opened by the Lord President of the Council on Monday, 20 June. The laboratory, which has been occupied for several months, comprises a three-storey block, a single-storey wing containing pilot laboratories and a number of detached buildings. Its completion has made it possible for all of the staff to be housed in the same building for the first time since the formation of the organisation in 1927.

The Name's the Same

High Vacuum and W. Edwards & Co. (London) Ltd. have become synonymous. So much so that the directors of the company have decided on a change of name and High Vacuum goes into the title of the company; Edwards High Vacuum Ltd. Also given a change of name is the subsidiary company, Ecam Ltd., which becomes Edwards Instruments Ltd.

Analytical Chemists Visit I.C.I.

About 130 analytical chemists were present at I.C.I. Nobel Division Works at Stevenston, Scotland, on Friday, 20 May, for the Symposium on Gas Chromatography, arranged jointly by the Physical Methods and Micro-chemistry Groups with the Scottish Section of the Society for Analytical Chemistry.

BCURA's Open Days

A press preview of the exhibits on view during the British Coal Utilisation Research Association's open days was given on Tuesday, 7 June, at the Association's Leatherhead laboratories. On Wednesday, 8 June, the laboratories were visited by members of the Association. We hope to publish an account of BCURA's work in a later issue.

Oil Companies Want Tax Relief

Three British oil companies have warned the Trinidad Government that unless they receive tax concessions their joint efforts to find oil from marine sources will be jeopardised. The companies are: BP, Trinidal Leaseholds, and the United British Oilfields of Trinidad. Their operations to find oil have cost over £800,000.

Leeds University Grants

Recent donations to the University of Leeds were: £400 from The Gas Council for Research into the bio-chemical aspects of sewage treatment; £100 from James Anderson & Co., Paisley, for the department of colour chemistry research; £50 from Shell Petroleum Co. Ltd. for field work in the department of geology, and £1,000 from Shell Research Ltd. for research in inorganic and structural chemistry; £1,000 a year for seven years from the Federation of Calico Printers for the department of textile industries.

• OVERSEAS •

New Branch in Tokyo

To stimulate sales in the Far East, Dow Chemical International Ltd. have opened a sales office in the Sanshin Building, Tokyo, Japan. Mr. H. Lee Clack has moved from Montevideo, Uruguay, to manage the branch. His assistant is Mr. Howard C. Visger who was formerly export manager of Dow Chemical of Canada Ltd.

Gas From Leased Land

The Commonwealth Drilling Co. Ltd. will undertake to drill for natural gas on land leased by The Consolidated Mining & Smelting Co. from Burns Foundation Ltd. near Calgary, Alberta. Cominco operates a fertiliser plant at Calgary, and uses gas as a raw material.

Records in Tinplate

Figures recently issued by the International Tin Study Group at the Hague reveals that mine production of tin in concentrates in Malaya in March was 5,190 tons; in Indonesia 2,381 tons; Belgian Congo 945 tons; Nigeria 729 tons. For the first three months of this year no figures are available for Bolivia. In the UK during March the tin consumption was 2,057 tons, the highest since October, 1952. Of this 1,034 tons was used for making tinplate which reached a post-war record output of 86,100 tons. In France tinplate production rose to 28,000 tons, another record.

Sinai Oil Discovery

Dr. Hassan Marei, Egyptian Minister of Commerce and Industry, has announced an oil strike at Balaim in the Sinai Peninsula. The new well, sunk to about 7,600 ft. and producing 3,000 barrels a day, was discovered by the Egyptian National Petroleum Company and the Société Co-operative des Petroles.

New Refinery Near Cairo

On 1 June, Colonel Nasser, the Egyptian Premier, laid the foundation stone of a £3,000,000 oil refinery near Cairo. When completed the refinery will process around 2,300,000 metric tons of crude oil carried from the Sinai Peninsula in the Suez-Cairo pipeline. The scheme is being constructed by the Italian consortium Dalmine-Snam, of Milan. The laying of the new pipeline across the desert is nearly completed.

New Cracking Unit

Shell-Berre, the French oil company belonging to the Shell/Royal Dutch Group, has started a catalytic cracking unit in its Petit Couronne refinery, near Rouen. It will produce 600 tons of high octane index petrol.

Fertiliser Plant for Sao Paulo

Within a year the State of Sao Paulo expects to have a nitrogenous fertiliser plant operating at Cubatao, near Santos. To be administered by Petrobras, the National Petroleum Authority, the plant will yield 350 tons of fertiliser a day with a nitrogen content of 20.5 per cent. The plant will use as raw materials residual gases of the Cubatao refinery.

Carbon Black Sales Down

The reduced output of cars and a strike in the rubber industry caused a slump in carbon black production in the US last year. The decline was primarily in Texas where there was a sharp reduction in furnace black output. Total US production declined by 12 per cent. The number of plants operating at the end of last year was 50. Two new furnace plants were opened, and four channel plants closed.

Oil Strike in Pakistan

Mr. N. M. Khan, Provincial Chief Secretary of East Pakistan, has announced the discovery of oil at Haripur. Mr. Khan said that the colour of the flames of blazing gases from a test well bored by Pakistan Petroleum, a Burmah Oil Co. subsidiary, indicated it was charged with oil. Drilling operations to determine the size of the oil reserve were held up by the fires.

Non-Caking Sulphate Fertiliser

Ammonium sulphate can now be bought in a new non-caking form announces The Consolidated Mining & Smelting Company of Canada Ltd. The company's ammonium sulphate is now treated by a process which coats the individual crystals to produce a fertiliser which is free flowing under normal conditions. Last year Cominco produced 700,000 tons of fertiliser, most of which was marketed in the US.

· PERSONAL ·

The following officers of the Association of British Sheep & Cattle Dip Manufacturers were elected at the annual general meeting held on 25 May:—*chairman*, MR. J. N. HOPE (The Standardised Disinfectants Co. Ltd.); *vice-chairman*, MR. W. A. C. HALL (Prince Regent Tar Co. Ltd.); *hon.* treasurer, MR. W. E. O. WALKER-LEIGH (Cooper, McDougall & Robertson Ltd.); *hon. auditor*, MR. R. J. HOPE (The Standardised Disinfectants Co. Ltd.); *secretary*, MR. W. A. WILLIAMS, M.B.E., B.Sc.

A Doctorate of Engineering degree will be conferred on SIR CHRISTOPHER HINTON, F.R.S., a member of the board of the UK Atomic Energy Authority for Engineering and Production, and managing director (Industrial Group), at the midsummer degree day ceremonies of the University of Liverpool at the Philharmonic Hall on 1 and 2 July.

At the annual general meeting of the Chemical Engineering Group of the Society of Chemical Industry which was held in London on Friday, 3 June, the following officers were elected:—*chairman*, MR. GEORGE BREARLEY; *hon. secretary*, MR. R. C. ODAMS; *hon. treasurer*, MR. F. A. GREENE; *hon. editor*, MAJOR D. M. WILSON; *hon. recorder*, MR. W. H. THORP; *general committee*, C. M. AUTY, W. K. HUTCHISON, W. C. PECK and I. MCN. SMALLWOOD.

DR. F. H. BANFIELD, Director of Research, British Food Manufacturing Industries Research Association, has been elected treasurer of the Microbiological Group of the Society of Chemical Industry. Dr. Banfield, through his Association, is responsible for researches into several types of manufactured foods.

The Willard Gibbs Medal, one of chemistry's highest awards, has been awarded to DR. FARRINGTON DANIELS, University of Wisconsin chemistry professor. The award was made at the annual dinner of the Chicago Section of the American Chemical Society. The medal is awarded each year to one of the world's chemists whose achievements have been outstanding. Since 1910 eight men who have won the medal went on to win Nobel Prize awards. Dr. Daniels won the award for his work as director of the metallurgical laboratory at the Unversity of Chicago in 1945/6 where early research on atomic energy was carried out; for his research on chemical kinetics, photosynthesis, utilisation of solar energy, and on the thermal fixation of nitrogen.

MR. E. L. SMITH, until recently the sales manager of Burnett & Rolfe Ltd., has formed a company to undertake design and fabrication of plant for the chemical, brewery, food and dairy industries. The company (Leonard Smith (Engineers) Ltd.) will specialise in the less common materials like stainless steel, nickel, etc. It will also take on pipework contracts and welded fabrication in mild steel. The company's offices are at: Abford House, London S.W.1. Tel.: Victoria 2793 and 4.

After 29 years with British Celanese, MR. S. J. ALLEN has been appointed an executive director. He will not, however, be a member of the board.

MR. R. B. WHALLEY, A.M.Inst.W., M.Amer.W.S., has joined the staff of Metal and Pipeline Endurance Ltd., as chief welding engineer. He was formerly welding engineer for the Central Electricity Authority, being responsible for the building up, management, and training at their National Training Centre for welders. He has been retained by the CEA as a guest lecturer at courses for station superintendents and engineers in London. Before joining CEA, Mr. Whalley was attached to the technical service and research laboratory of the Quasi Arc Company Ltd., Bilston, Staffs., for some years. His experience covers welding in the pressure vessel, shipbuilding and repair, high pressure/high temperature pipeline and oil pipeline fields.

Exports of measuring and control equipment made by George Kent Ltd. reached a record of £1,000,000 sterling in 1954, and this increase, together with that of home sales,

has necessitated some re-organisation of the sales staff. One effect of this is that MR. J. M. WHITE, lately chief sales engineer, will be appointed to the London office on his return from a visit to Canada. MR. J. THAM succeeds Mr. White as chief sales engineer.

MR. ROBERT Q. WILSON has been appointed UK representative for the international industrial research organisation, the Battelle Memorial Institute. He will maintain liaison for British firms sponsoring research at Battelle laboratories in Columbus, Ohio; Geneva, Switzerland; and Frankfurt/Main, Germany, from his London office at 46 Bryanston Street, W.1.

At their AGM at the St. Ermin's Hotel, London, on 20 May, the Society of Cosmetic Chemists of Great Britain elected the following officers and council members for 1955/56: *president*, MR. R. T. DOBSON; *vice-president*, MR. J. PICKTHALL, F.R.I.C.; *hon. secretary*, MR. F. RILEY; *hon. treasurer*, MR. H. J. LOVELL. *Council*: MR. H. W. AVIS, MR. J. BATHER, MR. H. HOLMES, DR. R. H. MARRIOTT, D.Sc., F.R.I.C., DR. A. W. MIDLETON, B.Sc., Ph.D., F.R.I.C., and MR. W. P. PEPPER, M.Sc.

MR. ROLAND VOORHEES, chairman of the Professional Development Committee for the A.I.Ch.E., has been appointed Associate Director of Development for the Chemicals and Plastics Division of Union Carbide and Carbon Corporation of New York.

Acetoacetarylamides

AN IMPROVED process for the production of higher-purity acetoacetarylamides has just been announced by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation. The new process gives superior products for use in the manufacture of organic pigments known as Hansa yellows and benzidine yellows. Arylamides are also of interest as intermediates for pharmaceuticals and rubber chemicals.

These higher-purity acetoacetarylamides wet-out more quickly and are easier to handle. Pigment manufacturers also report that the new-process arylamides give cleaner pigment tones. Hansa pigments have become increasingly important because of their use in latex paints and other coatings. The low toxicity of these compounds—compared with chrome yellows—has led to their widespread use in enamels for home use.

Copies of the technical bulletin (F-8259) describing the various arylamides including acetoacetanilide, acetoacet-o-toluidide, acetoacet-o-chloranilide, and acetoacet-o-anisidide, can be obtained from Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, New York.

Exemptions from Duty

THE Treasury have made an Order under Section 10(5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty for the period 4 June to 18 August 1955: 4-*tert*.butylcatechol; *OO*-diethyl 2-ethylthioethylthiophosphate; 3-dimethylaminophenol; *OO*-dimethyl 2-ethylthioethylthiophosphate-itaconic acid; β-picoline; sodium 2:3-dimethyl-1-phenyl-pyrazol-5-on-4-yl-N-methylaminomethane - monosulphonate.

It is also announced that the Board of Trade are considering the question of the renewal for the period 19 August 1955 to 18 February 1956 of exemptions from Key Industry Duty of articles under the Safeguarding of Industries Exemption Orders Nos. 1, 2, 3 and 4. Lists of the articles exempted from Key Industry Duty by these Orders until 18 August 1955 were published as Statutory Instruments 1955, Nos. 248, 450, 663 and 778 (see the Board of Trade Journal for 19 February, 26 March, 14 May and 4 June).

Wills

MR. CHARLES FREDERICK BURTON, of Applecross, Mount Road, Tettenhall Wood, Compton, near Wolverhampton, late of Prodorite Ltd., chemical engineers, Eagle Works, Wednesbury, left £61,559 (£60,681 net). Duty of £22,103 has been paid.

DR. JOHN HENRY WALES LAVERICK, of Collegiate Crescent, Sheffield, who pioneered the use of coke oven gas in British industry, left £545,505 when he died on March 23, aged 89. Duty amounted to £371,154.

Spain had a record production of mercury in 1954. Of the 1,483.5 tons produced, 1,100 tons were exported.

Publications & Announcements

THE APV Company (Wandsworth Park, London, S.W.18) have issued a leaflet describing the Paraflow, Type HMB, 'probably the most widely used plate heat exchanger in the world'. The plates are one-piece stainless steel pressings with the latest type of corrugated troughs giving the surface area and turbulence necessary to achieve maximum heat transfer efficiency. The depth of the troughs results in an extremely rigid plate able to operate under high pressures without flexing. The Paraflow has applications in the brewery and food industries. Copies of the leaflet are obtainable from the firm.

* * *

ASHMORE, Benson, Pease & Company, a member of the Power-Gas Group of Stockton-on-Tees, have issued an illustrated booklet 'The Manufacture of Heavy Capital Equipment', which shows something of the work done in their premises. The firm specialise in the making of heavy plant and equipment, and among the items shown are a complete debutaniser column, 82 ft. 6 in. long, destined for a petroleum refinery, and pure nickel components of a Krystal evaporator plant in the course of fabrication. An invitation is extended to existing and prospective clients to visit the works at Stockton.

* * *

FROM Redfern's Rubber Works, Hyde, Cheshire, comes a booklet which describes some of the properties of their rubber and ebonite. The booklet also provides background information about moulding and shows examples of actual products in which rubber or ebonite is used. It is addressed mainly to manufacturers who are thinking of using these materials, and at the back of the publication is an inquiry form, designed to be filled in, detached and sent to the firm.

* * *

THE fourth part of the 'Dechema-Werkstoff-Tabelle', edited by E. Rabald and H. Bretschneider, has now appeared. This part deals with the resistance to chemical action of a large number of materials when subjected to attack by chemicals ranging from 'Butane' to 'Cavite'. This part comprises 100 sheets. The publication of this part completes approximately one quarter of this standard work of reference, which is intended to extend to 1,600 pages dealing with the resistance to chemical action of materials used in the construction of chemical apparatus, plant and equipment. The tables are further supplemented by brief notes embodying the experiences of more than 25 years in the field. The greater portion of this fourth part deals with the action of calcium salts, and occupies no less than 35 sheets. Calcium sulphite is dealt with at great length, particular attention being paid to corrosion occurring in sulphite cookers. Calcium hypochlorite is also dealt with in accordance with its application as a disinfectant, an oxidiser and as a bleaching agent. The 'Dechema-Werkstoff-Tabelle' is published in typescript by the Dechema (Deutsche Gesellschaft für chemisches Apparatewesen). The price is DM.0.30 per sheet (DM.0.24 per sheet to Dechema members). Since the work also forms a basis for discussions, in the course of which further supplements and additions will be necessary, it cannot be purchased through booksellers. The Dechema, Frankfurt a.M. W 13, Postfach, will be glad to furnish a 16-page brochure upon request. This brochure contains specimen pages from the 'Dechema-Werkstoff-Tabelle' as well as a provisional index of materials and substances which it is intended to deal with in future parts.

* * *

LATEST leaflet issued by GWB Furnaces, Dibdale Works, Dudley, Worcs., covers their range of Powermaster packaged automatic boilers which are suitable for firing on oil or gas. The range extends from Model 15 with an output of 517 lb. of steam or 502,125 B.Th.U. per hour, up to Model 500, producing 17,250 lb. of steam or 16,737,500 B.Th.U. per hour. The boilers are claimed to be completely smoke-free, self-contained, fire-tested in the works before delivery and completely automatic in operation. Maintenance is said to be easy, and safety to be 100 per cent.

* * *

COMPARISONS of chemical and biological assays of samples of pyrethrum flowers is the subject of an article in a recent issue of *Pyrethrum Post*. Three strains of pyrethrum grown in southern Tanganyika were compared for pyrethrin content by chemical assay and for insecticidal activity by several

techniques of biological assay. Considerable differences were found between the results of the various methods of assay yet all agreed in showing two samples to be better than the third. Also in this issue is an account of some problems which occur in the analysis of pyrethrins, especially with regard to partially degraded materials.

* * *

LAMTIC pipework has been introduced by James Mitchell and Son (Greenock) of Greenock, Scotland, after some years of development work. The firm specialise in pipework for a wide range of industrial applications and have pioneered in Scotland the production of engineering plastics in this field. Lamtic is made from fibre glass, oriented and stressed, bound and set in a continuum of thermosetting, high polymeric resin. The range covers standard diameters from 1 in. to 6 in. nom. bore, with British and American standard nominal diameters from 6 in. to 60 in. Maximum length of pipework is 15 ft. and smaller in the larger diameters.

* * *

THE Quasi-Arc Company, of Bilston, Staffordshire, manufacturers and suppliers of electrodes, plant and accessories for electric arc welding, announce that they have now added to their wide range of arc welding electrodes the Zodian electrode for high speed production welding of mild steel. Zodian electrodes comply with BS 639 : 1952 and have the Code No. E217 to BS1719:1951 classification. They are approved by Ministry of Transport and Civil Aviation, Lloyd's Register of Shipping and Det Norske Veritas for welding mild steel in all positions, also by the Inspectorate of Electrical and Mechanical Equipment, Ministry of Supply, for welding mild steel components for which they are the inspecting authority. Other approvals are pending. Full technical information on Zodian electrodes can be obtained on application to The Quasi-Arc Company's head office at Bilston, Staffordshire.

* * *

PRESENT-day deterioration of African livestock is largely due to insufficient phosphorus in their diet. This deficiency can only be remedied by artificial supplementation, and this can be done by the provision of mobile bone meal factories which make available on the spot substantial quantities of phosphorus in the form of sterilised bone meal. A full account of all the factors concerned in the setting up of such a scheme is contained in *Colonial Plant and Animal Products*, Vol. 4, No. 4, published by the Stationery Office, price 5s. Also in this number is an account of an investigation which has been made into the possible uses of d-limonene, the principal terpene in orange oil, for which no large commercial outlet has as yet been found. Two chemical manufacturers have examined this product, which comes from the West Indies, and report that the market is somewhat limited. 'Limonene is a product in abundant supply and it is problematical whether material of the quality of the sample would command any substantial premium over the normal market quality.'

* * *

WITHIN recent years the use of voltages lower than the usual mains has become widespread in the chemical and other industries where a large number of portable appliances are in use. A double wound transformer is used, with an output of 110 v. In the case of single phase transformers the secondary winding is centre tapped to earth, giving an effective shock voltage of 55 which is stated to be relatively safe. Adoption of this system, it is stated, would probably halve the fatal accidents due to portable electric tools. It is necessary, however, to provide some form of protection in event of a failure of the earth lead and the Londex equipment type ELU has been designed for this purpose. This equipment can be used to control a large number of portable appliances and provides protection for operating personnel as well as eliminating possible sources of fire or explosion. More detailed information, together with information on other electrical appliances, may be obtained from Londex Ltd., 207 Anerley Road, London S.E.20.

* * *

PYROK, made by Pyrok Ltd., 401-4 Montrose Avnue, Trading Estate, Slough, Bucks, is a mixture of Portland or other types of cement, exfoliated vermiculite, a lime plasticiser and water. The vermiculite, which is an inert micaceous material, is broken down into small flakes and heated, when it expands to many times its original size. This exfoliated material creates minute air bubbles in the mixture, which give Pyrok its good thermal properties. Pyrok is normally applied with a spray gun and layers up to three or four inches thick can be obtained by successive applications.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

NEWFIELD LTD., London W., rubber manufacturers.—27 April, charge, to Barclays Bank Ltd. securing all moneys due or to become due to the bank; charged on property. *Nil. 30 September, 1954.

STRAWSON CHEMICAL CO. LTD., London E.—19 April, mortgage and debenture, to District Bank Ltd. securing all moneys due or to become due to the bank; charged on Pioneer Works, Marshgate Lane, Stratford, and a general charge. *£8,000. 14 January, 1955.

THERMO PLASTICS LTD., Dunstable.—29 April, £20,000 debentures; general charge. *£71,000. 18 December, 1954.

V. & E. PLASTICS LTD., Macclesfield.—27 April, to Westminster Bank Ltd. securing all moneys due or to become due to the bank; charged on leasehold 262 Park Grange, Park Lane, Macclesfield, and fixtures. *Nil. 1 April, 1954.

Satisfactions

V. & E. PLASTICS LTD., Macclesfield.—Satisfaction, 3 May, of charge registered 2 March, 1951.

BRITISH CELANESE LTD., London W.—Satisfaction, 30 April, of debenture stock registered 2 October, 1943, and 8 November, 1944, to the extent of £710.

CHEMICAL MANUFACTURERS DISTRIBUTORS CORPORATION LTD., London E.C.—Satisfaction, 29 April, of series of debentures registered 3 April, 1951.

STRAWSON CHEMICAL CO. LTD., London E.—Satisfaction, 27 April, of mortgage registered 9 January, 1951.

New Registrations

Ion Exchange Ltd.

Private company (548,852). Capital £100. Manufacturers of and dealers in chemicals of all kinds, etc. The subscribers (each with one share) are: S. A. Score Smythe and Pamela I. Blake. Solicitors: Linklaters & Paines, 6 Austin Friars, E.C.2.

Yorkshire Tar Corporation Ltd.

Private company (548,904). Capital £100. Manufacturers and merchants of tar and all other chemical products, etc. The subscribers (each with one share) are: Donald Best and Derek Chambers. Solicitors: Simpson Curtis & Co., Leeds 1.

Baby-White (London) Ltd.

Private company (549,288). Capital £100 in £1 shares. To carry on the business of manufacturers of and dealers in bleaching preparations for laundry or other use, etc. The directors are: Ervin Rabl, Jan Brosh and Leslie A. Ward. Secretary: Wendy Hutchinson. Registered office: 6, Hanover Square, W.1.

Lexington Pharmaceuticals Ltd.

Private company (549,227). Capital £100. Manufacturers of and dealers in laboratory reagents, chemicals, gases, drugs, pharmaceutical and medicinal preparations, etc. Directors: Louis Bihet and Joan Bihet.

Redactin Laboratories Ltd.

Private company (549,703.) Capital £100. To carry on the business of consulting, analytical, manufacturing, pharmaceutical and general chemists, herbalists and seedsmen, etc. Directors are: Sydney C. Bentley and Mrs. Bennie Bentley, directors of S. C. Bentley (Chemists) Ltd.

Roger & Martin Ltd.

Private company (549,928.) Capital £100. Mechanical, electrical, chemical and general engineers, etc. Solicitors: Keene Marsland & Co., 52 Mark Lane, London E.C.3.

Nickel & Alloys Ltd.

Private company (550,117.) Capital £100. Manufacturers, refiners, wholesalers and retailers of, and agents for nickel, nickel alloys and compounds and chemicals, etc. Directors: Royston G. Battin (director of Sofa Constructions Ltd.), Lionel W. Myers and Gwendoline M. Smith.

Company News

Brotherton & Co. Ltd.

For the year 1954 Brotherton & Co. Ltd. made an increased trading profit of £53,999 over that of 1953. The profit was £347,078. New plants and buildings commissioned during the year cost £129,000, and work to the value of £500,000 was in progress by 31 December. The directors hold the opinion that the revenue reserves, built up in the past six years, should be strengthened by the retention of a large proportion of each year's profits until the issued capital can be made truly representative of the increased capital employed in productive manufacturing assets. They felt justified, at this point, in recommending an increased dividend out of the profits earned in 1954.

W. Edwards & Co. (London) Ltd.

In May last year W. Edwards & Co. (London) Ltd., now Edwards High Vacuum Ltd., became a public company. Expansion has been marked, and a subsidiary company established in Canada. The year's trading profit of the company of £146,000 is some £12,000 more than for the previous year after providing £12,500 for the development of the Canadian subsidiary. Tax takes £82,000, although Excess Profits Levy has gone. The net retained profit after deducting the sum left with the subsidiary companies amounts to £50,000, as compared with £39,000 for the previous year. The hopes that a 25 per cent dividend on the ordinary shares would be paid have been fulfilled, and after transferring £50,000 to general reserve, will leave a carry forward of just over £40,000.

Consolidated Zinc Corp. Ltd.

The production of virgin zinc metal by the Imperial Smelting Corp. last year was the highest ever. It exceeded the 1953 record by 10 per cent. The increase came about from the development and extension of modern smelting processes. This was stated by Mr. John R. Govett, chairman of the Consolidated Zinc Corp. Results of CZC in 1954 showed a satisfactory increase, and the profit before taxation amounted to £4,696,142, compared with £2,516,562 for 1953. This result is arrived at after charging depreciation of £942,673, compared with £837,471 for 1953. Tax takes £2,229,409, compared with £1,043,799 for 1953. The net profit amounts to £2,383,378, compared with £1,393,022. Provisions set aside in previous years and no longer required total £141,490, and have been credited to the Consolidated Appropriation Account. Transfer to general reserve is £1,500,000. In January an interim dividend of 1s. 3d. was paid, and a final share of 2s. 6d. per share is being recommended.

Powell Duffryn Ltd.

Powell Duffryn Ltd. have announced the following dividend, payment to be made on 1 July to holders registered at close of business 3 June: 4¾ per cent cumulative preference shares—2⅜ per cent actual, less tax at 8s. 6d. in the £ on the 3,600,000 4¾ per cent cumulative preference shares of 10s. each for the six months ending 30 June, 1955.

Celanese Corp. of America

Directors of Celanese Corporation of America recently declared a dividend of 12½ cents a share on the common stock, payable 24 June, to holders of record 3 June, 1955. The board also voted regular quarterly dividends of $1.12½ on the 4½ per cent preferred stock, series A, and $1.75 on the 7 per cent second preferred stock. Both preferred stock dividends are payable 1 July to holders of record 3 June.

Timothy Whites & Taylors

Group assets of Timothy Whites & Taylors, chemists and household store proprietors, expanded from £12,433,095 to £13,191,339 during the year ended 1 January, 1955. Mr. G. I. Rushton will preside at the meeting at Grosvenor House, Park Lane, London W. on 23 June.

International Paint (Holdings)

At the AGM of the International Paint (Holdings) to be held 23 June at Grosvenor Gardens House, London S.W., it will be proposed that the directors' remuneration of £400 be raised to £600, with an additional £600 for the chairman.

Laporte Industries Ltd.

The directors of Laporte Industries Ltd. are recommending a final dividend on the ordinary stock of 11 per cent, less income tax at 8s. 6d. in the £, making a total of 16 per cent for the year ended 31 March. The consolidated income of the group for the year is £1,504,263 (inclusive of profits of new subsidiaries acquired during the year amounting to £356,400). These companies were: Fullers' Earth Union Ltd., Cleckheaton Chemical Co. Ltd., and Bierley Chemical Co. Ltd.

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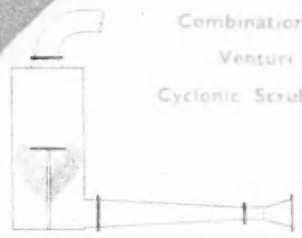
P-A (PEASE-ANTHONY) GAS SCRUBBERS



This is recommended in certain applications where dust and fume removal present an extremely difficult problem and the combination of the two Scrubbers is necessary to ensure the highest removal efficiency.

PGC

THE POWER-GAS CORPORATION LTD

(IN COLLABORATION WITH THE CHEMICAL CONSTRUCTION CORPORATION, U.S.A.)

STOCKTON-ON-TEES AND LONDON

AUSTRALIA · CANADA · INDIA · FRANCE · SOUTH AFRICA

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Company News

continued from p. 1310

Burmah Oil Co. Ltd.

The 53rd AGM of the Burmah Oil Co. Ltd. will be held on 24 June in Glasgow. In his statement, Sir Kenneth B. Harper, the chairman, says: Last year when comparing 1953 results I drew attention to a small increase in the volume of group sales and to a slight reduction in profit margins. This year I report a further increase in sales, although this again is accompanied by lower profit margins. After charging the cost of a comprehensive programme of exploration and including our interest in the trading of the Burmah Oil Co. (1954) Ltd., the Group's trading profit for the year was £5,131,211, compared with £5,330,987 in 1953. Deduction for depreciation amounts to £1,276,163, which corresponds closely to 1953. Income from dividends and interest at £4,228,005 is £646,093 higher than 1953, due mainly to increased dividends from the British Petroleum Co. and certain trade investments. The directors have allocated £1,100,000 to general reserve.

Ault & Wiborg

Ault & Wiborg, manufacturers of printers' inks, etc., is raising the annual dividend with a 25 per cent recommendation for the year ended 31 March, which compares with 17½ per cent previously. Group profits of £572,273 compare with £431,715 against which tax absorbs £283,094 (£237,885).

Next Week's Events

TUESDAY 14 JUNE

RIC (London Section)

Stafford: Visit to Quickfit & Quartz Ltd., Stone, Staffs, 1.30 p.m. (Euston 8.30 a.m.)

WEDNESDAY 15 JUNE

RIC (London Section)

London: Visit to A. Boake, Roberts & Co. Ltd., Walthamstow, E.17, 2.30 p.m.

THURSDAY 16 JUNE

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.30 p.m. 'Dietary factors in the protection of the liver, kidneys, heart and other organs in experimental animals—The lipotropic agents,' by C. H. Best, F.R.S.

SIC (Microbiology Group)

Harpenden: Visit to the Rothamsted Experimental Station, 11.15 a.m.

ICE (Graduates' & Students' Section)

Start of Swedish tour until 26 June.

FRIDAY 17 JUNE

RIC (London Section)

Betchworth: Visit to Beecham Research Laboratories, Betchworth, Surrey, 2.30 p.m.

SCI (Plastics & Polymer Group)

Hampton Court: Ladies' Night Dance, The Casino, Taggs Island, Hampton Court, 7.30 to 12 p.m.

Market Reports

LONDON.—Conditions on the industrial chemicals market have been fairly active during the past week and at the time of this report the effects of the rail strike have been much less pronounced than had been expected. Road transport cannot, however, cope with the normal movement of supplies and existing stocks in consumers' hands provide a temporary cover against delivery delays. In most sections of the market prices maintain a firm front. There is no new feature in the coal tar products market and the demand for the creosote oils, phenol and cresylic acid continues brisk, although the movement of supplies is presenting a very serious problem.

MANCHESTER.—Stocks of heavy chemicals held by industrial users in the Manchester area are said to be adequate in most instances to permit of uninterrupted working for the time being, but fresh supplies have been unmistakably affected by the railway dispute. Though fair quantities are being moved by road the supply position threatens to become very much more serious if the strike goes on for many days longer. Overseas shipments of chemicals have been hit by the Liverpool and Manchester dock labour troubles.

GLASGOW.—The impact of the rail strike is having its effect on the Scottish heavy chemical market. Every effort, however, is being made in an endeavour to maintain as far as possible continuity of supplies. Business during the past week, in spite of difficulties, has been fairly brisk with no important change in prices to be reported. There has also been an effect in regard to exports although a good volume of inquiries are being received.

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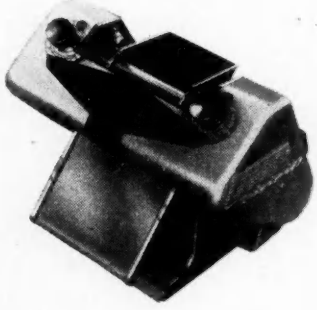

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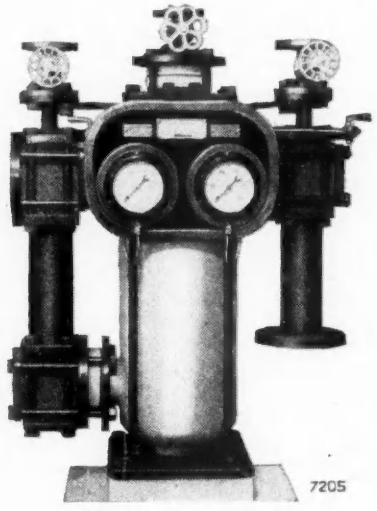

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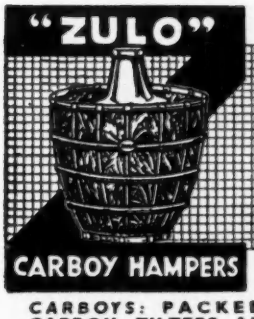

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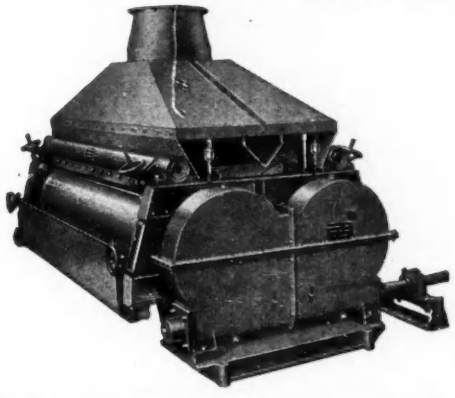

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